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A Critique of the Science Council's Concept of Canada as a Conserver Society

by

© Eva M. A. Luczynska

A THESIS
SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE
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Date October 15, 1981

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ABSTRACT

The objective of this thesis is to analyze the concept of a 'conserver society' as formulated by the Science Council of Canada in one of their reports. The sociology of knowledge is employed for this purpose.

The analysis has two aspects: firstly, to locate the concept within the ideology of the Science Council; and secondly, to determine how this ideology affects the adequacy of the proposals and recommendations for change put forward by the Council.

After considering the history, membership, and representation of the Council, some key assumptions of the authors on the nature of society and the sources of environmental problems are examined. Three aspects of the authors' analysis are subsequently considered: their perception of power, interests and conflict; their perception of distributive justice (both in contemporary society and in the proposed conserver society); and their perception of science and technology as they pertain to the transition to the conserver society (with particular attention given to energy-related technologies).

It is shown that in the case of each of these aspects, the authors' analysis and proposals for change are deeply flawed by their ideology. Power and interests are virtually ignored; the identification of societal goals with the collective good leads to the inability to take into account opposition from vested interests which would be threatened by such measures as total cost pricing. The authors see the transition to a conserver society as being accomplished by means of changes in values rather than social structure. They claim that the conserver society is to be not only sustainable but equitable, yet the proposals they make would have strongly regressive distributional effects. The discussion of technology, and 'conserver' (that is, environmentally and socially benign) technologies, suffers from the lack of coherent and systematically applied criteria.

The conclusion of the thesis is that a major objective of the conserver society proposals is the consolidation of capitalist enterprise, and the advancement of the interests of the scientific/technical elite. The Science Council's concept of a conserver society is, in Mannheim's use of the terms, ideological rather than utopian.

I. INTRODUCTION

Statement of the Problem

The objective of the thesis is to analyze and evaluate the concept of a 'conserver society' formulated in the Science Council of Canada report *Canada as a Conserver Society*. The report examines, in a Canadian context, issues which have become (particularly during the last decade) matters of global concern; energy availability, environmental damage, resource depletion, the role of technology, and the effects of economic growth. It is therefore a specifically Canadian variant of a much wider debate.

The theoretical approach adopted is that of the sociology of knowledge. The analysis therefore has two aspects:

1. the location of the 'conserver society' concept within the ideology of the Science Council, and
2. the evaluation of how this ideology affects the adequacy of the proposals and recommendations for change offered by the Council.

The concept of the conserver society is put forward by the Science Council both in terms of necessity (resource/environmental constraints), and desirability (preferable to the present society, and therefore a goal in its own right). The authors propose that the transition to a conserver society would involve change in two areas;

1. that of society/environment interactions, and

2. that of societal goals, particularly with respect to production and consumption

Science and technology, together with alterations in 'values', are the means advanced for the accomplishment of changes in both these areas.

The 'Conserver Society' Source Material

The Science Council proposal for a conserver society is to be found in *Canada as a Conserver Society: Resource Uncertainties and the Need for New Technologies*, Science Council Report No. 27, published in September 1977.[1] The Science Council adopted the proposal for a specific study in June 1973, and its Committee on the Implications of a Conserver Society put out a position paper, "Toward a Conserver Society - a Statement of Concern" which was published in *Science Forum* in June 1976.

The five principal policy thrusts of the report are as follows:

1. concern for the future,
2. economy of design,
3. diversity, flexibility and responsibilty,
4. recognition of total costs, and
5. respect for the regenerative capacity of the biosphere (CCS: 7).

The authors emphasize:

---

[1] The abbreviation CCS will be used to refer to this report.

> we are not attempting to set out a complete blueprint for a new society, nor to specify the exact modes of transition or how long they may take. The Report should be seen as our view of some new directions related to science and technology that the conserver principles imply (CCS: 15).

Background to the Idea of a Conserver Society

The origins of the conserver society concept may be traced back to various realizations which began to surface during the 1960s.

Firstly, there was a growing anxiety over the seemingly uncontrollable expansion of science and technology, and their effects on the environment. Secondly, actual or impending scarcities of resources (including energy) began to receive more attention. And thirdly, as economic growth began to slow down and ceased to be taken for granted, both its sustainability and desirability began to be questioned.

The Environment

When the environmental movement emerged during the 1960s, many critics were quick to claim that it was no more than the periodic re-emergence of concern with a problem which had existed throughout history; that the activities of human beings had been altering and polluting their environment at least since the development of agriculture, and probably before. They cited such examples as air pollution due to coal burning in medieval London, desertification caused by overgrazing, and lead poisoning caused by lead plumbing in ancient Rome, all to demonstrate that there was no particular justification for talking of an environmental *crisis*. In addition, they pointed to past periods of extreme pessimism about the future of the human race.

But such arguments were a two-edged weapon; clearly, the long history of human-caused degradation of the environment was no reason for complacency. Many environmentalists not only acknowledged but emphasized this past history, stating however that the damage had recently undergone not only a quantitative but a qualitative change:

> The belief that the end of the world was drawing nigh was widely held at different times in human history. But from this historic fact there is no consolation. Only since the last war have men prised open Pandora's box, and have discovered technologies for destroying all life on earth many times over... (Mishan,1971 :10).

Evidence suggested that the degradation of the biosphere to a point where it might become uninhabitable as a consequence of human activities was a possibility which could no longer be ruled out. The intensified burning of fossil fuels introduced the possibility of climatic change. Nuclear power created radioactive waste products whose half-life could be measured in tens of thousands of years. The new environmental damage could be dramatic in scale, for example when accidents to super-tankers resulted in oil spills larger than ever before. It could also be gradual and insidious, as in the case of acid rain which damaged forests and lakes, often at great distances from the source of the pollution. It could also be far-reaching, as the case of pesticides demonstrated; the simplistic model of a substance with one specific limited effect was inadequate (Carson, 1962). DDT killed the insects against which it was directed - for a while, until resistant strains developed - but by accumulating in the food chain it also killed predators, and in addition became so widely dispersed that it was found in the bodies of living creatures thousands of miles from the area of application. The interactions between an organism and its environment were found to be far more complex than previously accepted.

Some criticism of the environmental movement was obviously a reaction to its apocalyptic tone. However, complaints that ecology had ceased to be a scientific discipline and had become an attitude of mind (Maddox, 1972: 135) seemed largely motivated by a belief that the general public should not trespass on the preserves of scientists, but should rather limit its concern to calling for more science funding. Maddox and other like-minded critics were disturbed to find that disputes between experts were no longer confined to the respectable privacy of specialist journals,[2] and that such terms as exponential growth, ecosystem, biodegradability, and synergistic effects had somehow entered the public vocabulary, and were being militantly (though sometimes inaccurately) employed by non-specialists.

---

[2] An editorial in *Nature* said with reference to "A Blueprint for Survival" published in the *The Ecologist;* "the magazine deserves to be taken to task if only for having recruited a 'statement of support' from 33 distinguished people, many of them scientists, at least half of whom should have known better.... That professional people should lend their names to attempts like these to fan public anxiety about problems which have either been exaggerated or which are nonexistent is reprehensible" (*Nature*, 1972: 63).

Inevitably, some of this ecological attitude of mind was superficial, and much of the enthusiasm transient; nevertheless, a genuine and widespread concern for the environment survived after the environmental movement had ceased to be a much publicized media event.

Energy and Resources

One approach to the prospect of scarcities of energy and resources is to redefine it out of existence:

> ...the problem of raw materials is not a problem of the exploitation of a finite resource...but is a problem in economics - how best to regulate the prices of raw materials so as to balance the present demand against the probable demand in the future, how best to encourage what kinds of substitutions, how best to bring into production new reserves...(*Nature*, 1972: 65)

There is a certain - though very limited - validity to this view, since given the possibility of substituting one resource for another, of improving extraction techniques so that lower grade sources can be used, and of exploiting hitherto inaccessible reserves, the problem of resource scarcities is unlikely to be critical in absolute terms in the foreseeable future. To state the matter in these terms, however, is to oversimplify the issue: other problems than those of economics are involved; those of international and national politics, since resources create conflicts between producers and consumers; ecological problems, since the substitution of one resource for another (for example tar sands for oil) may be more harmful environmentally. There are trade-offs involving different kinds of resources, as in the case of potential damage to fisheries caused by off-shore drilling.

The exploitation of lower grade reserves tends to be more energy intensive, and to result in a greater volume of waste products. The exploitation of less accessible energy reserves is in general more difficult, more expensive, and carries higher environmental risks. For example,the possible consequences of drilling for oil in the Beaufort Sea may be very severe but are as yet little understood.

It had been commonly assumed that by the time oil supplies ran out sufficient nuclear energy would be available to ensure a smooth transition. But the 'early promise of the 'peaceful atom' - energy 'too cheap to meter' - was not fulfilled. A number of drawbacks began to appear simultaneously: construction and operating costs began to rise steeply; the problem of permanent disposal of radioactive waste remained unsolved; the health risks of low level radiation were discovered to be more serious than previously believed; the public acceptability of nuclear power plants began to decrease; and it became clear that a society dependent on nuclear power would necessitate a 'nuclear priesthood' (Weinberg, 1972).

Resources which are in principle renewable have in practice increasingly been depleted as rapidly as non-renewable resources. Agricultural land is destroyed by cities, highways, airports and mining; poor forestry management results in soil erosion; fish catches are reduced by over-fishing, destroyed or made toxic through pollution. Moreover, the exploitation of renewable resources is frequently dependent on the availability of non-renewables; as the CCS authors remind us, Canadian agriculture is dependent on low-cost petroleum (CCS: 27).

Economic Growth

> At a minimum, the antigrowth school clearly placed into question one of the great assumptions of modern industrial society: that growth, with its accompanying benefits of rising living standards, more goods, increased leisure, education and welfare, would continue on into the indefinite future more or less as it had in the recent past. And this, in turn, raised the possibility that the central economic experience of the Western World since the Industrial Revolution was a once-for-all phenomenon, unsustainable into the future... (Gill, 1976: 125).

But the 'antigrowth school', while admitting the existence of more goods, also questioned the reality of at least some part of the supposed rise in living standards and welfare, and pointed out the inadequacy of such indices as the GNP, which gave a misleading impression of the benefits of economic growth (Mishan, 1967; Boulding, 1971; Daly, 1973).

In addition, the 'rediscovery' of poverty in the 1960s brought about the realization that poverty had not (as many optimistically assumed), been eradicated by the supposed trickle-down effect of economic growth (National Council of Welfare, 1973).

Economic problems are exacerbated both by anti-pollution measures, and by higher resource and energy prices - particularly by the latter, since our society has grown so dependent on cheap energy. As late as 1973 the authors of one study predicted that crude oil prices would reach a level of $7.00 per barrel by the year 2000, and regarded this as a substantial increase (Department of Energy, Mines and Resources, 1973: 64).

> In the 1960s, economists often talked about self-sustaining growth forever. No one does that anymore. Whether because of, or in spite of, the Doomsday prophets, everyone now recognizes that...we have been living through a relatively unique historical period... (Gill, 1976: 134).

The idea of a conserver society, of steady-state economics, seems incongruous only in the context of very recent history, and in the context of the belief that economic growth is a panacea for all problems.

Limits to Growth

In *The Limits to Growth* (Meadows et al.,1972), the authors attempted to demonstrate that exponential growth in any one of a number of sub-systems (population, resources, capital, pollution, agriculture) inevitably leads to global catastrophe. Cole et al. (1973) sharply criticized both the assumptions and methodology of the authors. They described the book as "Malthus with a computer", and reminded us of the aphorism "garbage in, garbage out" (Freeman, 1973:5). Yet however flawed the Club of Rome report might be, it proved extremely influential both as a stimulus to public awareness of the ongoing debate about limits, and in establishing the idea that "the future will not be simply an extrapolation of the past" (CCS: 11).

This debate led to a revitalization of earlier criticisms which had stressed the inherent defects of unrestrained economic growth and environmentally harmful practices. There was thus a fruitful convergence of various strands of thought, with the realization of the need for change combining with the belief in its desirability. The cessation of certain forms of growth can be regarded as a constraint to be denied, or circumvented, or at best reluctantly accepted. But the realization of the necessity of change can also be seen in positive terms, as an opportunity and a challenge;

> It is now understood that in many fields the continuing expansion of current practices will not be possible in future. This recognition is having a strong and stimulating effect; far from being restrictive, it is releasing creativity, imagination and initiative all around the world (CCS: 6).

Theoretical Approach

The perspective adopted is that of the sociology of knowledge, that is, concerned with the "varying ways in which objects present themselves to the subject according to the differences in social settings", and with the question of how "social structures come to express themselves in the structure of assertions, and in what sense the former concretely determine the latter" (Mannheim, 1936: 265-6).

The sociology of knowledge will therefore be used in an attempt to interpret the Science Council report by taking into account the relationship between the text and the existential factors of its production.

In the creation of any intellectual product, some issues are regarded as coming within the scope of the enquiry while others are excluded; some aspects are pushed into the foreground while others remain unnoticed and unremarked; some assertions are regarded as being self-evident and others in need of justification. This filtering process is neither intrinsic to the subject matter being investigated, nor is it arbitrary nor irrelevant, but may best be understood and explained by reference to the social location of the producers. Furthermore, such phenomena as internal inconsistencies, or failures to follow an argument to its logical conclusion, or to see the implications of an assertion, may in fact have a consistent basis when the ideology of the producers is taken into account.

CCS deals with an area where what should be included is neither self-evident nor - what is perhaps another way of saying the same thing - mutually agreed on by all those involved. The idea of a 'conserver' society - or of a 'sustainable' or 'steady-state' society - is still quite new, and is in the process of evaluation and re-evaluation. Inevitably, there is no consensus on what a 'conserver society' could be or should be, nor on how it could be or should be achieved. More important is the fact that there are not as yet several acknowledged competing variants, which might have the advantage of being clearly defined, with their implications clearly spelled out. Many questions about a 'conserver society' can be asked; few are mandatory, yet the questions asked delimit and control the possible answers. Given this present fluid situation, what is *not* said may be at least as important as what is, since it structures perceptions in a less obvious and obtrusive manner. Given the multiplicity of potential approaches, the choices made in selecting, formulating and defining the whole *problematique* of the 'conserver society' become of particular interest and importance.

When the problem is stated in these terms, the sociology of knowledge is seen to be a particularly suitable and fruitful theoretical approach to the interpretation of the report, and to the elucidation of the linkages between text and context. CCS will therefore be regarded as an intellectual product of the Science Council; an aspect of one of the "diverse interpretations of the world which, when their social background is uncovered, reveal themselves as the intellectual expressions of conflicting groups struggling for power" (Mannheim, 1936: 269).

However, as Mannheim frequently stresses, it is important to remember that the identification and elucidation of the perspective of a thinker

> as yet tells us nothing about the truth-value of his assertion. It implies only the suspicion that this assertion might represent merely a partial view (1936: 284).

To relate the Science Council analysis of resource/ environment problems to its social background does not in itself invalidate that analysis. Its 'truth-value' must be evaluated by other means; by such criteria as whether their proposals would achieve the results claimed for them in terms of solving resource/environment problems; what other effects thay would have; whether alternative solutions are possible and/or desirable.

Departing from Mannheim's interpretation, scientific knowledge will be regarded not as the objective representation of the physical world, but as one form of knowledge among others, and therefore influenced by the interests of its producers and by the social and cultural context in which it is produced (Barnes, 1977; Mulkay, 1979b).

Some Definitions

Ideology is defined as "a pattern of beliefs and concepts (both factual and normative) which purport to explain complex social phenomena with a view to directing and simplifying socio-political choices facing individuals and groups" (Gould and Kolb, 1964:315). This pattern of beliefs and concepts comprises a *perspective*. Following Mannheim, there is a correspondence between a given social situation and a given perspective (1936: 58).

Power is defined as "the capacity to maintain and reproduce a given pattern of structured social inequality over time" (Baldus, 1975:180), while social inequality "exists where an individual or group in a social system are excluded from behaviour which is open to others" (Baldus, 1975: 188).[3]

The term 'politics' is used to refer to that which concerns the allocation of resources[4] within the context of relationships of power. Rodman reminds us that *"the ultimate political struggle is for control of the definition of 'the political'"* (1974: 15. Emphasis added).

Utopianism and Planned Change

The CCS authors argue that

> we face a period of exceptionally rapid change and transition, the extent of which are not yet clear. *The future will not be simply an extrapolation of the past* (emphasis added) (CCS: 11).

The report is, therefore, a proposal for the transformation of the present society to a future society organized on different principles. The idea of a future which "will not be simply an extrapolation of the past" may potentially be regarded as utopian, that is, a situationally transcendent idea which has a transforming effect upon the existing historical-social order (Mannheim, 1936: 205). There are grounds for thinking that the authors see themselves as being involved in some such enterprise, since they stress not only the necessity but the desirability of a conserver society. The existence of environmental and resource limits should be regarded not as a barrier to the attainment of a better society but as an incentive and opportunity:

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[3] Baldus is concerned with emphasizing that power relationships need not a) involve direct interaction between units b) be characterized by resistance.

[4] This recalls Lasswell's "who gets what, when, how" (1958).

> We see novel technical processes, fresh designs, new theoretical models, the questioning of established concepts, and experimentation at the workplace and in the community at large (CCS: 6).

As Mannheim observes, the contemporary connotations of the word 'utopian' are predominantly of an idea which is in principle unrealizable, but he goes on to emphasize the relativity of the concept of unrealizability;

> The representatives of a given order will label as utopian all conceptions of existence which *from their point of view* can in principle never be realized (Mannheim, 1936: 196).

Margolis points out that reflections on the utopian oblige us to consider the existence of certain general constraints on all forms of deliberate social planning;

> absolutely *all* of the forms of large-scale social existence in the Western world are, effectively, either indifferent to the imminent exhaustion of the non-renewable resources of the world, particularly fossil fuels, or else simply incapable of extending their favoured mode of life on the basis of realistic estimates of how long they may count on maintaining their present level of supplies. So seen, *every* familiar system of life is, in the pejorative sense, utopian....Alternatively put, assuming this condition or others (like pollution) that, in principle and within our technological capability, may actually still be reversed, the only

> realistic line of ...social planning *is* (on the alternative reading of the term) the visionary and utopian.... The more radical the departure from prevailing institutions, the more utopian the thinking and the work. But that has nothing to do with how realistic such an endeavor may be. After all, if the survival of an entire culture is at stake, can one doubt that a utopian solution, if it is attractive, may be realistic as well? (Margolis, 1979: 58).

This aspect of the utopian - the transition to a state of society which would be more viable in the long term - recurs constantly in CCS.

Limitations

Some aspects of the Science Council's industrial strategy and proposals for technological sovereignty impinge on their concept of a conserver society, and will therefore be discussed. However, any attempt to evaluate the Science Council's industrial strategy in its entirety would be beyond the scope of the thesis.

Organization of the Thesis

Chapter 2 examines the Science Council and its development since its establishment in 1966, and varying interpretations of the concept of science policy.

Chapter 3 isolates the main elements of the CCS view of society, which are identified as being the 'order' approach to social structure and social change, and the assumption of the availability of objective knowledge. It considers how they affect the CCS report in terms of the inclusion/exclusion, emphasis/de-emphasis of various issues related to the origins and possible solutions of resource and environmental problems.

Chapters 4-6 examine how this perspective structures three different aspects of the CCS analysis and proposals for change: interests, power, and participation (Chapter 4); distributive justice (Chapter 5); science and technology (Chapter 6).

Chapter 7 summarizes and brings together the various aspects of the thesis. It sums up the strengths and weaknesses of the Science Council's proposal for a conserver society and recommendations for bringing it about.

II. THE SCIENCE COUNCIL AND SCIENCE POLICY

Establishment of the Council

The Science Council of Canada [5] was founded in 1966. According to the Act of Parliament by which it was established, the Council's duties are "to assess in a comprehensive manner Canada's scientific and technological resources, requirements and potentialities and to make recommendations thereon to the Minister"[6] (SCC, 1967a:

---

[5] References to Science Council publications will be abbreviated SCC.

[6] The relevant section of the Act continues:

"...and in particular it shall be the duty of the Council to give consideration to, and make reports and recommendations to the Minister on,

a. the adequacy of the scientific and technological research and development being carried on in Canada;
b. the priorities that should be assigned in Canada to specific areas of scientific and technological research;
c. the effective development and utilization of scientific and technological manpower in Canada;
d. long term planning for scientific and technological research and development in Canada;
e. the factors involved in Canada's participation in international scientific or technological affairs;
f. the responsibilities of departments and agencies of the Government of Canada, in relation to those of universities, private companies and other organizations, in furthering science and technology in Canada;
g. the statistical and other information on scientific and technological research and development that should be obtained in order to provide a proper basis for the formulation of government policy in relation to science and technology in Canada; and
h. the best means for developing and maintaining co-operation and the exchange of information between the Council and other public or private organizations concerned with scientific, technological, economic or social aspects of life in Canada" (SCC, 1967a: 26).

25-26). A program of publications was planned as part of the Council's activities.

The Science Council described its function as being:

> to ensure that Canada has a strong and competent, alert and growing scientific community and to advise the Government on how best to use science in the solution of the economic and social problems of Canada (SCC, 1967a: 1).

The International Context

The establishment of the Council must be seen against the background of the international development of science policy, and the establishment of science policy advisory councils as an aspect of that policy. By the early 1960s, science policy advisory councils with memberships consisting entirely or partly of non-governmental scientists were in existence in Britain, the USA, France, West Germany and Sweden (Brickman and Rip, 1979:168).

The military value of scientific projects during the Second World War, and the intervention of governments in the direction of these projects, resulted in research being viewed as a form of national investment, and an important source of military and political power (Salomon, 1977). However, the term 'policy' connotes both deliberate intention and coherence (King, 1974: 44), and the institutionalization of permanent and widespread government/science interaction was a gradual process in the post-war years; it received a considerable stimulus from the first Sputnik (Salomon, 1977). During the 1960s, the

Organization for Economic Cooperation and Development (OECD) produced a number of reports dealing with various aspects of science policy, in particular with the need for and the mechanisms of international information exchange and cooperation, and, of course, the relationship between science policy and economic objectives. Between 1966 and 1973, OECD published a series of *Reviews of National Science Policy*.[7]

Council Membership and Representation

The membership of the Council[8] was originally divided almost equally between the government, industry and university sectors (ten, nine, and ten respectively).[9] According to Doern (1972), this attempt to maintain a sectoral balance was a deliberate and important aspect of science policy.

Members from the university and industry sectors may at first sight appear to be two distinct groups, with distinct objectives and aspirations. In a sense, the scientists are representatives of the whole scientific community, with an obvious and overt interest in 1) maintaining the status of science as a form of organized knowledge, 2) attempting to increase the availability and status of employment for scientists by obtaining the necessary funding, and 3) demonstrating the relevance of scientific research to other areas. But Doern concludes:

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[7] The review of Canada was published in 1969.

[8] According to the Science Council of Canada Act, membership of the Council was to consist of "twenty-five members chosen from among persons having a specialized interest in science or technology" and "four associate members chosen from among officers or employees of Her Majesty employed in departments or agencies of the Government of Canada" (SCC, 1967a: 24).

[9] Only the four associate members were explicitly identified as coming from government, but in addition there were six heads of federal agencies on the original Council (Doern, 1972: 95). Associate memberships were abolished some years later.

> if there is a constituency, it is a constituency of "top men". Most council members...have neither the time nor the inclination to be anything approaching a grass roots "M.P." for science (1972: 99).

In addition, Doern emhasizes that the mission-oriented approach of the Council received considerable criticism within the scientific community.

The distinction between the university and industry groups is blurred by the similarity of their disciplinary affiliations; almost exclusively they are natural or applied scientists or engineers; moreover, both groups are in favour of a new sectoral balance with a major increase in the amount of industrial research and development (R&D). The Council had, from its beginnings, expressed concern with the fact that industrial R&D expenditures were less in proportion to GNP in Canada than in other OECD countries - particularly with respect to industrial research supported by government contracts (SCC, 1967a). In the Canadian context, government sponsored economic nationalism is the obvious form for scientific/technical aspirations to take.

Among the members of the original Council were: the president of the National Research Council; the chairman of the Medical Research Council; the manager of the Noranda Research Centre; the president of Atomic Energy of Canada Ltd.; the president of R.C.A. Victor Co. Ltd.; the vice-president of CIBA Co. Ltd.; the director of the Institute of Aerospace Studies, University of Toronto; the president of Polymer Corporation Ltd.; and the chairman of the Defence Research Board.

The first chairman (who held the office for two terms, i.e. six years) was Dr. O. M. Solandt. His research background was in physiology; later he was at different times the chairman of the Defence Research Board, head of R&D with Canadian National Railways, and vice-president of R&D of the de Havilland Aircraft of Canada and of Hawker Siddeley Canada (Doern, 1972: 91). During the time of his chairmanship of the council he was vice-president of the Electric Reduction Company of Canada Ltd., a firm whose products were charged with being a major source of controversial phosphate pollution. "Solandt suggested publicly that those who called for the banning of phosphates were grossly oversimplifying the water pollution problem. Charges were subsequently levelled that Solandt's science policy role and his industrial interests were in conflict" (Doern, 1972: 91).

The career background of the Science Council's first chairman illustrates the extent to which it would be misleading to regard the science, industry and government representatives on the Council as distinct groups.

The Early Optimism

The most obvious and striking change in the outlook of the Science Council during the first few years of its operation is the abandonment of the optimism with which it started. As the Chairman of the Council said in 1975, "viewed in retrospect, the mid-sixties were a golden era for science and technology, an era of enthusiasm, of rising budgets and rising hopes" (SCC, 1975: 29).

The Science Council was established towards the very end of this golden era; within a very short period of time general faith in the beneficence of science began to wane, the problems with which it was expected to deal increased in number and complexity, and increases in science funding did not match expectations.[10] The faltering of the facile early optimism is eloquently documented in the annual reports. The euphoria of the first report - "we are like other countries riding on a wave of social and economic expansion" (SCC, 1967a: 14) modulates to foreboding; "the whole world is restless and turbulent..." (SCC,1970: 28), while by the following year "it seems that [man] is bent on pursuing a lemming-like course toward his own destruction" (SCC, 1971b: 31). It might be said that within a few years the Council moved from a position of being sure that it knew all the answers to one of wondering what the questions were.

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[10] The Council had hoped that R&D expenditure as a percentage of the GNP would increase from 1.3% in 1966 to 2% in 1972. However, the actual 1972 figure was only 1.4% (SCC, 1972a: 54).

From Policy for Science to Science for Policy

The decline of optimism on the part of the Science Council is paralleled by a significant change as to what it regards as included in the concept of science policy.

According to King (1974: 37), the distinction between policy for science and science for policy was first made in the OECD report *Science and the Policies of Governments* (OECD, 1963). The former refers to policy for the development of science itself; such issues as support and management of the reseach system, science education, allocation of funds, and the coordination of participation in international scientific projects. The latter refers to how scientific resources can best assist in the achievement of national policies concerned with social, political and economic matters (King,1974; Salomon,1977).

However, as Brickman and Rip (1979: 181) note, such a change of emphasis creates various problems for science advisory councils, not least the fact that when advice is in the area of more general issues, the pronouncements of scientists are not always seen as qualitatively superior to those of others. The pressure on advisers to supply advice which is perceived as acceptable is therefore increased.

In the earliest writings of the Council, science policy is equated with policy for science. Science for policy is given virtually no explicit consideration; it is simply assumed to be the automatic outcome of an adequate policy for science. The first annual report claims that "the final aim of the [research] programs is the improvement of human welfare" (SCC, 1967a: 18), but the impression given is that human welfare will in some unspecified way turn out to be a by-product of well organized and well funded research programs; the intrinsic value of scientific knowledge and research is unquestioned, nor is their assumed relationship with human welfare. In *Towards a National Science Policy for Canada* it is stated that "the value of any scientific enterprise to a society is determined by the social, cultural and economic goals that that society seeks" (SCC, 1968: 13), but these goals are stated in the broadest possible terms, and the contribution of science and technology to their attainment is equally non-specific.

However, in the sixth annual report the Chairman announced that the Council was "remaking the discovery that in human affairs everything is related to everything else" (SCC, 1972a: 53). By the following year the issue is explained thus:

> The Council has consciously moved away from the simple role of advocate of science and technology to a more complex position in which it attempts to question where our society is going and how it plans to use the tools of modern technology (SCC, 1973: 36)

This extension of what the Council perceived as coming within the area of its concerns may be regarded both as an advance on a simplistic and self-satisfied view of science as a panacea, and as an attempt at empire building - a wish to include virtually everything within the scope of science policy.

Several factors contributed to this shift of perspective. Among them was the changing attitude to science and technology both among the general public and in government; to the extent that research and development were no longer perceived as unconditionally valuable, their practical and policy-related aspects needed to be stressed. Moreover, the Council soon lost its unique advisory status;[11] as in other countries, science and technology policy-making became gradually incorporated into the regular processes of government (Brickman and Rip, 1979: 177-8), which further inspired the Council to reinterpret its own contribution. In addition, the Council had been faced in its early days with the need to gather and analyze a substantial amount of data; "although a very useful and extensive array of background information was prepared for the Science Council, the very process of preparation emphasized the many gaps in our knowledge and inconsistencies in our records of science in Canada" (SCC,1967a: 8); as this preliminary task was gradually accomplished it became both possible and necessary to turn to other areas.

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[11] The Ministry of State for Science and Technology was created in 1971.

The Interaction of Publications and Policy

The publications program is both evidence of the broadening perspective of the Council, and a factor contributing to it. It is necessary to take into account

> the educative component involved in the carrying out of a study. The act of carrying out a comprehensive study automatically brings with it a substantial transference of information among the individuals, groups or institutions involved (SCC, 1973: 37).

This learning process contributed to the realization that the interaction of science and society was not so simple as had been previously assumed. The emphasis of the publications program changed from policy for science issues considered in reports such as *The Proposal for an Intense Neutron Generator* (SCC, 1967b); *University Research and the Federal Government* (SCC, 1969); *Policy Objectives for Basic Research in Canada* (SCC, 1972b) - to more general areas such as urban development (SCC, 1971a), energy conservation (Knelman, 1975), and population growth and the changing age structure (SCC, 1976a).

The 1973 decision to engage in a study on the implications of a conserver society can therefore be regarded as the logical outcome of this broadening of perspective. CCS is not, however, simply one report out of many; from that time onward there was increasing emphasis in the annual reports on conserver issues, and the tenth annual report stated that the Council had identified three themes around which it would structure its program. These themes were:

1. the implications of a conserver society,
2. technological sovereignty and an industrial strategy, and
3. the health of the Canadian scientific community (SCC, 1976: 18).

Industrial Policy and Technological Sovereignty

Part of the science for policy move was a growing involvement in industrial strategy. As mentioned previously, the Council had extensive industry representation since its inception; the number of members with industry affiliations on the original Council was ten, while during the first ten years of the Council's existence it fluctuated between seven and twelve.

The importance of industrial R&D and the need for strong links between industry and the scientific community had been assumed since the beginning, but there was a renewed emphasis on closer communication with industry in the mid 1970s (Spurgeon, 1976: 14). The thirteenth annual report notes that "interaction among government, universities, and industry is stressed" in the recommendations of the Council (SCC, 1979a: 17). There was an increasing awareness throughout the 1970s of the importance of a coherent industrial strategy, of the negative effects of foreign ownership, and the need for technological sovereignty.

It is worth noting that although the first annual report mentions "extensive foreign ownership and unusually easy access to new technology for import" (SCC, 1967a: 16), this is regarded as a situation to be lived with rather than an important issue calling for action. Ten years later, the retrospective interpretation is somewhat different; the Chairman's statement in the eleventh annual report includes the claim that "the Science Council has advocated technological sovereignty in one form or another since its first annual report in 1967" (SCC, 1977a: 26), and goes on to quote from that report to substantiate his claim. However, the "special difficulties" which are mentioned in the quotation from the first report actually refered to geography, not the need for technological sovereignty. The juxtaposition of the two reports is interesting not simply as a minor example of the tendency to reinterpret the past with the benefit of hindsight; more importantly, it illustrates the extent to which the attempts to develop a viable and flourishing Canadian industrial R&D had, in the intervening years, become part of an explicit strategy of economic nationalism.

Doern (1972: 175) points out that the Council's support for intersectoral involvement in major programs has been influenced by the model of the American space program;

> American industry has been mobilized by the military and space programs. Canada's industry would be mobilized, not by participation in military goals, but in other social missions.

The increasing Science Council involvement in industrial strategy demonstrates the convergence of economic nationalism with the interests of an aspiring indigenous Canadian capitalism, and with those of the scientific/technical elite.

III. THE CCS VIEW OF SOCIETY

Introduction

Chapter 3 examines how various assumptions affect the CCS perception of the nature of resource/environment problems, and indicates the consequences and implications of this in terms of what are perceived as the solutions to these problems.

It must be emphasized that whether or not it is explicitly recognized as such, the issue of a conserver society - involving as it does questions of resource use and allocation - is necessarily a political issue. As Simonds (1978: 97-99) notes, the interpretive method of the sociology of knowledge is particularly suited to the political sphere. He gives three reasons to support this contention:

1) The language of politics presents 'objects' (such as 'class', 'the free market', 'the democratic state') which are not directly in evidence, but which none the less direct, justify, and render intelligible much of what is said and thought; the intersubjective meanings which mediate such phenomena have especially decisive significance when they inform decisions on how to influence or change a situation.

2) Politics is characteristically directed toward ends which implicate others, and comprises in large part decisions respecting the allocation of limited collective

resources. Its discourse is essentially public, in an arena where different groups, interests, and traditions meet, which makes the interpretive problem of understanding a matter of pressing practical concern.

3) Politics is oriented toward the future;

> The problem of the relation between thought and social position is especially acute in connection with political phenomena because the conceptual resources available to any group must (if they are to be effective) be oriented to its *interests* in the essentially political task of shaping its collective future (Simonds, 1978: 99).

Though all political discourse is in varying ways concerned with the allocation of limited resources and is oriented toward the future, this seems to be particularly true of a text such as CCS, the subject matter of which is the fundamental revaluation of practices which relate to the consumption and allocation of limited resources, and which proposes a variety of ostensibly necessary and/or desirable actions to achieve this end. The ideology of the authors - the pattern of beliefs and concepts utilized by them in explaining complex phenomena and simplifying socio-political choices - must therefore be given careful consideration.

Both the composition and the function of the Science Council are of crucial importance in establishing the Council ideology, as expressed in CCS. The strong industry representation accounts, on the one hand, for the stress on the importance of the market:

> one of the virtues of our free enterprise system is the great range of diverse products and services it has created, and the constant flux of innovation it maintains. We must take care not to jeopardize that diversity... (CCS: 30)

On the other hand, it accounts for the insistence that all possible government support should be given to Canadian owned industries which are perceived as having a role to play in the conserver society. As Enzerberger (1974: 12) points out, one of the consequences of environmentalism is that "industrial protection of the environment emerges as a new growth area", and that "problems attendant on industrial growth serve to promote new growth...". This is particularly apparent in the superficiality of the criteria which are applied to establish the 'conserver status' of various technologies (this aspect is discussed in Chapter 6). In addition, the repetition of the mutuality of labour/ management relations can also be attributed to this component of the Council membership.

The interests of the scientists are expressed in the assumption of the objectivity and neutrality of scientific knowledge; in the insistence on the indispensibility of scientific knowledge to the solution of all problems, both technical and otherwise; in the reiteration of the need for more research. However, it must be stressed that science and industry cannot be regarded as two distinct categories in the composition of the Council. Most of the industry representatives have a scientific or technical background; many of the academic scientists have industry affiliations

As has been said before, the interests of Canadian capitalism converge with those of the scientific/technical elite.

The Council's function as a government advisory body contributes both to the CCS assumption of apolitical objectivity, and to the extremely conservative slant of the report; as Brickman and Rip (1979: 180) point out, science-for-policy advice is "given - or at any rate followed - only within the well-defined frameworks of departmental objectives". The bias caused by the perceived need for advice to be acceptable to the recipients leaves little room for any radical analysis of the issues involved. The very choice of the name "conserver society" (rather than, for example, Daly's (1973) "steady state" society) is significantly non-controversial and imprecise.

Since any analysis of environmental problems and society/environment interactions necessarily contains a number of ideology-derived assumptions concerning the nature of society, this chapter attempts to identify the main CCS assumptions and locate them within the Science Council ideology. But, as said before, to relate the CCS analysis to its social origins does not in itself achieve much; it is also necessary to demonstrate how the inadequacies in the analysis and recommendations are intrinsically connected to these assumptions.

A. The CCS Assumptions

> ...interpretations of the origins of environmental problems flow from differing assumptions regarding the theoretical issues of the nature of man, society, inequality, the state, and the primary causal forces underlying social change (Buttel, 1976: 310).

These assumptions structure the formulation of the conserver society problematic in terms of what issues are to be regarded as central, peripheral, or irrelevant. They determine the perception of obstacles to the elimination of resource/environment problems, and what may be counted as possible/effective/desirable solutions.

The identification of the underlying assumptions in CCS is particularly important since the report contains much that is extremely vague - to the extent that it is sometimes extremely difficult to establish precisely what (if anything) is being said. In the interpretation of the text, therefore, while individual statements, discussions of specific issues, omissions, emphases, repetitions etc. serve to identify the underlying assumptions, the assumptions may be used to clarify the meaning of individual statements which are ambiguously phrased or otherwise obscure. This is, of course, simply another way of saying that meaning is dependent on context.

Buttel (1976) suggests that current analyses of natural resource and environmental problems fit the two broad divisions of social theory, i.e. the "order" and "conflict" approaches. Table 1 summarizes his formulation of the

TABLE 1. Assumptions in the order and Conflict Approaches to Social Structure, Social Change, and Environmental Problems

Theoretical Issue	*Approach*	
	Order	*Conflict*
Nature of society	System with "needs"	Stage for class struggle
Social unity	Consensus	Coercion
Class	Heuristic device	Social groups with differing interests
State	Promotes common good	Instrument of oppression
Major unit of analysis	Group	Class
Primary causal forces underlying social change	Culture, values	Exploitation, alienation, class conflict, contradictions
Values, culture	(First-order causal force)	Second-order consequence of political power (hegemony) and class domination
Power	Differentiated, "multicentred" origins, pluralistic	Results directly from economic power
Relationship of society and resource base	Adaptation to survival base as functional requisite of society	Capitalism degrades environment through irrationalities of productive system
Nature of environmental problems	Result from externalities and inappropriate values	Embody irreconcilable contradictions
Resolution of resource problems	Adaptive cultural mechanisms	Recurrent cycles of crisis and re-equilibrium

Source: Buttel (1976: 311).

theoretical postulates of these approaches. He notes that

> the order approach seems to be the most prolific paradigm with respect to formulating environmental policies. Entree into policy initiation inevitably leads the researcher into linkages with the administrative and funding agencies of the state, which are likely to be suspicious of or hostile to those who speak in the tongue of conflict analysis (1976: 321).

The Science Council's role as a government advisory body makes it unsurprising that the "order" approach should be adopted, and that conflicts of interests should be downplayed as much as they are. CCS fits very well with the "order" approach of Buttel's taxonomy, although the theoretical issues which he identifies receive greatly varying amounts of attention. The agreement is most marked with respect to the nature of society and social unity, the origins of environmental problems, and the role of values as a primary causal force underlying social change.

Social Unity and Societal Goals

The CCS assumptions concerning the nature of society and social unity are reflected in the language used. The recurring image of society in CCS is that of a monolithic entity, which 'chooses', 'decides', 'builds' and 'acts'. This is given additional emphasis by the use of the first person plural; at times this is simply the authorial 'we', but far more frequently it is used to give a spurious air of facticity to the assumed consensuality of goals and practices:

> Unless we, as a society, develop better management techniques...
>
> ...the way in which we generate our incomes, the way in which we use our leisure time...
>
> We must change many of our expectations...
>
> When we ask just *what* we produce altogether...we shall find some things we want to change.

The defects of the present society are seen as being the responsibility of all members equally; the costs of the transition to a conserver society must be shared equally, and the result will be "an eventual improvement in the quality of life for everyone" (CCS: 36). To the extent that the collective good is not being achieved (society is on a collision course with resource scarcity, and its interaction with the environment is clearly unsatisfactory), this can be attributed to the fact that societal goals are misdirected, are informed with insufficient understanding, or perhaps insufficient wisdom and maturity: "we are like the adolescent who has suddenly come of age, possesses all his/her faculties and must now make decisions that will affect the rest of his/her life" (CCS: 24). This emphasis on the *collective* responsibility for resource/environmental problems, and the *collective* nature of the efforts necessary for their solution should be seen in the context of Enzerberger's criticism of the widely-used metaphor of spaceship earth; that its aim is to deny the difference between first class and steerage passengers (1974: 15).

That societal goals might be dominated by minority interests is a possibility not admitted by the authors;

societal goals are invariably equated with the collective good. Yet as Lenski notes,

> we are obliged to define as the goals of a given society *those ends to which the more or less coordinated efforts of the whole are directed - without regard to the harm they may do to many individual members, even the majority*. This means, in effect, that in those societies controlled by a dominant class which has the power to determine the direction of the coordinated efforts of society, *the goals of society are the goals of this class* (1966: 41).

The plausibility of the imputation of consensus as the basis of societal order rests on the fact that in times of relative peace and stability the perception of order is experientially confirmed. Opposition, protest and resistance are certainly seen as existing, but they are seen as being articulated and expressed through well-defined existing mechanisms - they are therefore 'taken into account' and are part of the overall process of the development of consensus.

In his critique of the concepts of power and authority, Baldus (1975) is concerned with the need for an approach which can include within the analysis of power both those relationships in which there is an absence of overt resistance, and those in which there is an absence of direct interaction between the units of a system.

As regards the former, Baldus contends that functionalist and exchange theorists as well as 'conflict theorists' such as Dahrendorf, assume in their analysis of power that

> structures in a society which are not opposed by a substantial portion of the populace must be fair and equitable. An absense of opposition is thus a reliable indicator of the objective justice of the structure in question...The absence of conflict effectively terminates the investigation of power (1975: 187).

As regards the latter, Baldus stresses that although at any given time no interaction exists between most units in a social system, yet,

> In addition to direct interaction, the various parts of a social system are linked together by a wide variety of non-interactive relations which are essential to the system's functioning. In the most general sense they include cases in which a behavior of one unit becomes a necessary condition for the goal-realization of another even though the two do not interact...Such non-interactive links are of prime importance in maintaining and reproducing system structures, including structured forms of social inequality (1975: 181).

Baldus says therefore that power should be defined as "the ability of a center unit to maintain, reproduce, or reinforce over time its position with respect to a periphery unit in a structure of inequality in which both are a part" (1975: 188). Behaviour which maintains the inequality structure may originate with the centre, the periphery, or with a third party or outside institution. Periphery behaviour may be complementary, adaptive, adjustive; it may contribute to the maintenance of the inequality structure without being a direct response to a prior centre initiative but simply a reaction to the experience of social inequality. Centre efforts include the creation of cognitive images of inequality which make it appear acceptable, deserved, or unalterable (Baldus, 1975: 189-191).

The Origins of Environmental Problems

In the CCS interpretation, the nature of resource/ environmental problems may be summed up as *unnecessarily high throughput* (involving both wasteful use of resources and pollution of the environment); its solution consists of "doing more with less" (CCS: 28) - a phrase that recurs throughout CCS. The origins of resource/environmental problems may basically be traced firstly, to certain aspects of industrialization, and secondly, to the existence of 'externalities'.

In a letter responding to criticism of the CCS summary which first appeared in *Science Forum* in 1976, Cordell (one of the CCS authors) explains that

> The desire to engage in growth for its own sake might, in fact, be a function of a certain type of industrialization (either capitalistic or socialistic) (Cordell, 1976: 1).

Thus, while the meaning of "growth for its own sake" remains as mysterious as ever, it is made quite clear that *capitalism* as such is not a factor that needs to be considered. How this unrestrained growth took place is never clearly specified; increasing production and consumption (coupled with a lack of appreciation of the finiteness of the earth) somehow gave rise both to wasteful practices and to the general belief that unceasing growth was possible, and indeed, inevitable and desirable. The realization of the existence of limits (another recurring CCS phrase) and of resource/environment constraints is therefore a necessary condition for the establishment of a conserver society.

According to the CCS authors, the problem of externalities can be dealt with by technological fixes which reduce and minimize pollution, together with a suitable mix of regulatory incentives and penalties; that is, by internalizing the externalities and making the cost of every commodity reflect its total cost.

Unnecessarily high throughput can therefore be regarded as characteristic of a transitional phase in industrialization, which is eliminated by moving to a later, more mature conserver phase.

The authors devote a considerable amount of attention to the ways in which planned obsolescence contributes to unnecessarily high throughput; they also conclude that in this respect "the silly season seems to have passed its peak and industries and consumers both have entered a more mature phase" (CCS: 66). This suggests that the emergence of planned obsolescence was somehow accidental; that its functions and benefits are symmetrical with respect to both producers and consumers; that capitalism can continue to operate as before while dispensing with the profit motive.

Values and Attitudes

> A conserver society is not something that can be legislated into existence...Legislation can only confirm and formalize ethical rules and principles that are generally believed in. Individual citizens, educators, business people, engineers, if they agree with the principles set out here, will change their perceptions of our society and its problems, and

> will do things differently...widespread sharing of perceptions is fundamental. (CCS: 72).

The key phrase here is "if they agree with the principles set out here". Taken in isolation, it suggests that in terms of the CCS positivistic fact/value distinction, conserver principles are a value, and their acceptance or rejection a matter of preference. However, the whole tenor of the report is that the 'facts' of the long-term unviability of the present society are not in doubt. Although the authors maintain throughout a tone of moderation, carefully avoiding possible accusations of 'doomsterism', yet they stress that "the times will no longer allow us the luxury of evasion" (CCS: 24). They claim to have identified "some of the technological paths that lead in the right direction, toward sustainable relationships with material resources and the biosphere" and regarding these paths "in our view we do not have much choice" (CCS: 14). The choice, therefore, insofar as it exists, is between rationality and irrationality, and to do anything other than choose a conserver society would be irrational.

Conserver principles must therefore be accepted as a value voluntarily now, or involuntarily later. From these new values flow new perceptions and attitudes, and the assumed link between attitude and behaviour is seen as being simple and non-problematic.

Objective Knowledge

Buttel does not discuss the role of knowledge among the assumptions associated with the order and conflict approaches; but the existence of objective, neutral, value-free knowledge is assumed throughout CCS, as is the possibility of its serving as an unproblematic basis for decision-making. The authors see the role of certified knowledge-holders - by implication scientists - as being the delimitation of valid options from which choices may be made:

> we possess the technical and scientific knowledge to foresee the consequences of our acts with reasonable certainty (CCS: 24).

and again

> ...the study of the scientific and technical components of a problem may not be a sufficient condition for its solution, though it is a necessary one. Without sound knowledge of viable scientific alternatives, no progress toward a solution can be made (CCS: 5).

Implicitly, scientific knowledge is taken as the model of *all* knowledge, and the authors take for granted a pre-Kuhnian view of the epistemological status of science. Briefly, this is based on the claim that the priveleged status of science as a form of organized knowledge derives from its subject matter; science is based on observable facts about the material world, and the relationships between them. Since natural phenomena are invariant, observation of these phenomena procedes with increasing accuracy and completeness. Scientific knowledge is progressive and cumulative; each generation of scientists advances it by refining and amplifying the work of those preceding them. Scientific knowledge is therefore 'true' in a way in which knowledge dealing with phenomena other than those of the natural world can never be; there is a clear distinction between 'fact' and 'value'.

This view of science has been challenged from many quarters in recent years, with perhaps the most influential single work being Kuhn's analysis of the non-rational elements in the structure of scientific belief, and the incommensurability of different paradigms (1970). It is possible to regard scientific knowledge as just one form of knowledge among others, and therefore influenced by the interests of its producers and by the social and cultural context in which it is produced (Barnes, 1977; Mulkay, 1979a, 1979b). To the extent that the priveleged epistemological status of science is claimed to be a function of its subject matter, and to the extent that the fact/value dichotomy is stressed, the claim of scientists to speak authoritatively on issues other than purely technical in areas dealing with the application of science should logically be weakened. For example, even if the science of nuclear physics deals purely with 'facts', the question of whether nuclear generating stations should be built inevitably deals with 'values'.

In principle, it would seem that the claim to the priveleged epistemological status of scientific knowledge could be accepted while rejecting the claims of scientists to speak authoritatively when they go beyond the limited area of their expertise. However, claims to the possession of specialized professional or technical knowledge or expertise are generally based (implicitly or explicitly) on the supposed efficacy of the application of scientific method. The 'objectivity' of the knowledge which results from the application of scientific method legitimizes the power of specialized authorities to deal with issues which come within the supposed area of competence of 'experts', and the defining of an issue as professional or technical highlights some aspects while masking others.

The presumed existence of an epistemologically unique category of knowledge serves by extension to legitimize other knowledge claims, with the assumption that so long as the correct scientific method is applied, valid knowledge will be produced. The nature of this knowledge is seen as being such that those who possess, create, define and interpret it are automatically unbiased and disinterested. The role of the knowlege elite can then be seen in terms of the delimitation of options, from which the rest of society can make choices.

The CCS authors seem to be influenced by Bell (1973), who predicts that in the coming post-industrial society in which technical knowledge and skill become of ever-increasing importance, the power base will shift to this new knowledge elite. But Bell provides very little evidence for his hypothesis. Notwithstanding the primacy of knowledge in his post-industrial society, there is no adequate explanation of why power would be wielded by a knowledge elite rather than that the knowledge elite would be utilized and co-opted by the powerful. Marien argues:

> Expertise may become increasingly central to policy making, but the experts do not necessarily gain more power. In fact, they may well be reinforcing the status quo, if not contributing to further domination by the power elite (Marien, 1973: 269)

However, CCS avoids Bell's difficulties in explaining such a power shift by simply refusing to face the question of who holds power. Their whole analysis is based on the assumption that knowledge is objective and neutral, and is therefore the only valid ground for political, social, and economic action. References to choice are made, but it is clear that very little choice is perceived as existing, except in the matter of timing. The conserver society can be introduced *soon* with relatively few problems, or *later* with many. However, as Simonds (1978: 99) stresses, when dealing with essentially political choices, the notion of the priveleged observer standing outside of the historical process serves to disguise rather than eliminate the distortion of parochial interest. Since social actors draw on a repertoire of cultural resources to interpret social phenomena (Mulkay, 1979a), the claims and language of science - of objective, value-free knowledge are conveniently on hand for the CCS authors.

B. Order, Knowledge, and Their Consequences

The assumption of the availability of objective knowledge and the order approach, are nowhere explained or justified; no arguments are given in their support; they are simply presented and repeated as self-evident, 'the way things are'. While not logically interdependent, they complement each other well, and provide mutual reinforcement.[12] To some extent it is possible to say that in the CCS discussion of the conserver society they serve to define respectively the end and the means. The former simplifies the difficulties of defining what should be done; the latter minimizes the difficulties of how to do it, and the barriers to the transition. *If* knowledge is unproblematic, and *if* social unity is based on consensus, then it logically follows that the main impediment to appropriate action is not vested interests operating within asymmetrical power relationships, but lack of understanding of the issues involved, which may be overcome by information, education, involvement in discussion, etc. (i.e. dissemination of knowledge).

Contradictions arise, however, out of their perceived need for radical changes in respect of resource and environmental issues, and their maintenance of a general defensive strategy against radical social change; there is therefore a critical/defensive paradox - how to unite the perception that "the future will not be simply an extrapolation of the past" (CCS: 11) with the hope/intention that in most respects it *will* be.

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[12] A survey of senior civil servants in three European countries indicated that those trained in the natural sciences and technology were most likely to downplay the existence of divergent interests and conflict (Putnam, 1977).

IV. INTERESTS, POWER, AND PARTICIPATION

Introduction

This chapter is concerned with various aspects of interests and power relevant to the concept of the conserver society. It examines the CCS concept of total cost pricing, and proposals for its implementation, and reviews the case of mercury pollution, which is cited by the authors as an example of the total cost principle in operation. It considers the ways in which resource and environmental interests differ according to class. It examines what the authors say on the issue of participation and its benefits, and concludes with a consideration of the relevance of Buttel and Larsen's analysis of coalitions in conditions of scarcity.

The CCS assumption of consensus as the basis of social unity, and the identification of societal goals with the collective good, automatically excludes any systematic analysis of power,conflict, and interests; the unproblematic convergence of individual, group, and societal interests follows from the original assumption. The CCS authors admit the existence of conflict, but for them it is seen not as the outcome of competing interests, but simply as "conflicts between the preferences of various segments of society" (CCS: 5).

As might be expected, the exclusion of power and interests from the CCS analysis is not total. For example, they refer to the fact that "some organizations in our society have the power to pass on their costs to others" (CCS: 67) (government departments, large business corporations etc.), and suggest that research is needed in this area since "understanding and moderating the operation of the 'cost-plus' economy is essential for an orderly transition to a conserver society" (CCS: 88). But the existence of these

> power nodes [which] can plan and expand with impunity, without being subject to the checks and balances of market place and democratic process (CCS: 88)

is recognized only peripherally, and not systematically incorporated into the CCS perspective. This leads to fundamental inadequacies and distortions in their analysis of the causes of resource and environmental problems, and, inevitably, in their perception of the changes needed for the transition to a conserver society.

The Total Cost Principle

The CCS authors suggest that the implementation of the total cost principle has two requirements: the first is the identification and recognition of externalities by those who are creating them, while the second is the regulatory mechanism for taking them into account. Of the first requirement they say:

> Much of the waste and excess that has characterized our "consumer" culture has resulted from not taking the total costs of our actions into account. If the total costs - the true costs to others, to ourselves, and to future populations - could be seen for what they are, a conserver society would be an almost automatic result (CCS: 34).

If formal or informal cost/benefit analyses are indeed done in this way, influenced neither by interests nor power, and if the requisite shared values and understanding can be brought into existence, and in turn bring into existence the second requirement - "the discipline of regulation, taxation, and other penalties" (CCS: 35), then the establishment of the total cost principle becomes largely a technical issue - admittedly a complex and difficult one involving the identification and calculation of externalities, and the development of the optimal regulatory mix of incentives and penalties.

It should be noted that to a certain degree the ability to pass on costs - which is elsewhere regarded by the authors as a problem - is seen here to be the solution of that problem, simply on the assumption that producers etc. are both willing and able to pass costs on to the true beneficiaries.

The Total Cost Principle in Operation

The example which the CCS authors give of the total cost principle in operation is illuminating:

> ...some years ago it was "cheaper" for pulp and paper manufacturers to flush mercury down the drain than to remove it through a costly extraction process. We now realize that externalizing costs in this way resulted in imposing costs on those people who ate the fish from the waters polluted by the mercury. We now realize, too, that the price of the pulp and paper was artificially low. To build in a mercury extraction process has been costly. But now the costs are beginning to be borne by the producers and in turn passed on to consumers. Prices now reflect more closely true production costs. As the price has increased the market feedback system has become a better allocator of resources (CCS: 34).

The internalization of the externalities of mercury pollution is therefore presented in terms of the CCS model of the convergence of the scientific knowledge of hazards, the technical means of their elimination, and the operation of the market, uniting to bring about the understanding and action required for the implementation of total cost pricing. In their account, everything seems to have worked as it should, thus validating the adequacy of the model. The example is therefore worth analysing in some detail, since the 'fit' between the example and the model is achieved only by means of a description containing major inaccuracies and omissions.

Although mercury has been known to be a toxic substance for some thousands of years, the process whereby inorganic mercury in water is transformed into organic mercury, concentrated in the food-chain and introduced into the human diet (mostly in the form of fish), was demonstrated in the early 1950s in the fishing community of Minamata, Japan. The polluter in this case was Chisso Chemical. In spite of the fact that research into Minamata disease was for some years consistently suppressed, distorted and ignored, the causal relationship between mercury and the disease was clearly established by 1962 (Watanuki, 1978).

In Canada, the most extensive - and ultimately widely publicized - mercury contamination occurred in northern Ontario, where a number of pulp and paper companies are located. Most severely affected were the Indian reserves of Grassy Narrows and White Dog (Troyer, 1976). A Science Council report (SCC, 1977: 19) says of the events that occurred here, "there has been real difficulty in getting access to pertinent data", and refers to Troyer's book for an account of the difficulties involved.

Although not specifically mentioned with reference to the case of mercury pollution, the CCS account implies the successful operation of "the discipline of regulation" (CCS: 35) referred to previously. However, the author of a Science Council background study on regulatory processes says of the slowness and selectivity with which the regulations were enforced:

> There is much ground for criticizing this excessive flexibility in that it establishes both the fact and the appearance of a regulatory process far too closely aligned with industry (Doern, 1977: 136)

and points out that the company which was the slowest to install mercury emission control equipment (Dryden Chemical, a subsidiary of Reed International) had been the recipient of Department of Regional Economic Expansion grants, and was therefore "a vehicle of both the federal and provincial governments' regional economic development programs, a factor which cannot help but influence their overall regulatory response..." (Doern, 1977: 149).

The CCS account is basically of a scientific/technical problem, with a satisfactory scientific/technical solution.Yet Doern concludes from his analysis of the regulatory processes affecting six hazardous substances in Canada:

> In general...the six cases tend to show that lack of causal knowledge and/or lack of control technology is not the major variable preventing regulatory reforms. There is far more evidence to indicate that basic economic and political factors and pressures are the key to real reform (or the lack of it)... (1977: 159-60)

As regards the technical aspects, it is important to bear in mind that the *availability* of emission control equipment was not a problem at all; it was the *cost* of plant conversion which was one of the factors leading to delay, and the inaction of regulatory agencies. As regards the scientific aspects, the events illustrate the fundamental weakness of the CCS assumption of the neutrality of knowledge and the disinterestedness of expertise. Many of the experts involved (scientists, lawyers, government officials) used their expertise to delay the implementation of "true production costs" and to assist the polluting companies in the avoidance of legal responsibility. The case of mercury pollution is in no way exceptional in this respect; Epstein (1978: 16) suggests that

> Escalating evidence shows that constraints on data - from gross inadequacy, biased interpretation manipulation, suppression and even outright destruction - are commonplace...such evidence now justifies strong reservations as to the validity of any data developed by institutions or individuals whose economic interests are directly or indirectly affected.

In the CCS interpretation, the processes by which "true production costs" can be established take place within a power vacuum. The authors ignore the realities of asymmetries of power between those who bore the costs of mercury pollution and those who reaped the benefits; that is, they ignore the inequality structure within which the processes develop. As Doern stresses, "no understanding of the mercury regulatory process can make sense except in the context of federal and provincial policy toward Canada's native population..." (1977: 136). They ignore the fact that the polluters were powerful multinationals with whose interests the interests of various industries, politicians, regulatory agencies and experts were involved. Troyer (1976: 16) quotes the opinion of a Japanese observer:

> If Chisso was bankrupted by damage suits...there would be a run on the stocks and shares of every industry which pollutes...So Chisso won't ever fail - the other big industrial companies don't dare let it go down...

Marchak (1975: 1) defines ideologies as "screens through which we perceive the social world...". It is this screening aspect of ideology which is particularly striking in the CCS perception of the viability of their proposals for the implementation of total cost pricing. Some aspects of social reality have been completely filtered out and have become imperceptible. The case of mercury pollution typifies the operation of what CCS calls the 'consumer society'; their interpretation of the case, with the systematic distortion of the evidence necessary to regard the problem as solved, illustrates the fundamental weakness of their proposals for its abolition.

Bender argues that "the failures of token conservation attempts are endemic to capitalism, and that the goals of environmentalism cannot be reached short of a fundamental reorganization of society" (1979: 165). The CCS claim that the case of mercury pollution can be regarded as an environmentalist success certainly provides evidence for this argument.

Environmental Interests According to Class

Buttel and Larson (1980) suggest that the environmental interests of various structural groups not only differ from each other, but are likely to differ between the long and short run.[13] They distinguish between the 'administrative' and 'democratic' realms of the state, i.e., its bureaucratic and parliamentary segments, and note the ascendancy of the administrative over the democratic sector of government as state intervention in the economy increases (see Table 2).

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[13] They distinguish between the short and long run by "the emergence of resource scarcity at some future point, which undermines the traditional trajectory of exponential economic growth" (p. 329).

TABLE 2. SHORT-TERM AND LONG-TERM ENVIRONMENTAL INTERESTS OF MAJOR STRUCTURAL GROUPS

Structural group	*Major Subgroups*	*Short-term environmental interests*	*Long-term environmental interests (under scarcity)*
Capitalist class	Monopoly sector Competitive sector	Production, profit (maximize economic growth and resource flows)	Control (maintain control over resource flows)
Working class	Monopoly sector Competitive sector	Consumption and employment security (maximize economic growth and resource flows)	Social change (alter conditions under which resources are appropriated for or allocated to production and consumption activities); improve health and safety aspects of work and residential environments
Middle class		Enhance social status (expression of "environmental responsibility", status interest,and/or pursuit of of nonmaterial aspects of of quality of life)	Maintain social status and consumption status (continuity of 1970s environmental advocacy? abandon environmentalism to protect consumption status?)
State	Administrative sector Democratic sector	Principally, enhance profitable capital accumulation; secondarily, maintain social harmony and legitimation (maximize economic growth and resource flows)	Principally, maintain social harmony and legitimation; secondarily, enhance profitable capital accumulation (continued tendency toward resource-expansion policies, but this may be altered by conflicts expressed within the state)

Source: Buttel and Larsen (1980: 330)

They see the short-term interest of the working class as being involved in the maximization of economic growth and resource flows, but its long-term interests are a shift from production for private profit to production geared to social needs - "the goal is to increase labor's share of the social product by politically constraining the allocation of scarce resources for private profit"(p. 334). The goal of the capitalist-industrial class continues to be the production and sale of commodities from which profits can be derived, but with an increased emphasis on maintaining control over resource flows. The middle class, which provides the majority of political support for pro-environmental measures in the short run, is more difficult to predict in the long run; the continued advocacy of environmentalism might undermine its consumption and employment status. In the long run, the interests of the state switch from a primary emphasis on ensuring the conditions for capital accumulation, to legitimation.

It would appear, therefore, that only in the case of the capitalist class do both the long and short term interests require that priority should be given to the availability and control of resources - and that this is the class which has most to lose by the principle of total cost pricing, which would necessarily limit both the availability and more particularly the control of resources. Yet the CCS authors appear to believe that the total cost principle could be implemented without powerful and effective opposition from the vested interests thus threatened by severe constraints on their freedom of action.

Participation

References to participation proliferate in CCS; it is regarded as beneficial in itself (since it is part of the democratic process), and also as something for which there is increasing public demand:

> (a) The demand to participate in the decision-making process will continue and increase. Canadians want to take part in those decisions which will affect their lives (CCS: 21).
>
> (b) Citizen groups are forming to discuss the pros and cons of major decisions that will impact on us all. The planner is often frustrated by these groups since many seem to say the same thing: slow down and open the process so that we can participate and have something to say about our future....It would be unfortunate if citizen group concern were interpreted as confrontation for its own sake (CCS: 27-8).
>
> (c) ...decentralization, can conserve when it encourages responsible participation. The latter, and the sense of independence and freedom that comes from self-reliance, can be additional positive values in themselves... (CCS: 32).

References to participation are numerous, but on analysis it becomes clear that the word is used in three distinct senses, each of which has a strictly limited meaning:

1) A means of defusing conflict; quotation (a) continues "[t]he desire for participation, in the industrial context, will only be realized to the extent that labour and management move away from we-they confrontation politics toward recognition of a new mutuality of interests." It is

clear that the possibility of workers' control is not even considered;, and that the participation is to be purely nominal. A later reference to "the emergence of new worker-management modes of interaction" (CCS: 33) seems to have in mind no more than the human relations school of mangement - hardly to be described as new.

2) A process whereby participation in discussion is used as a substitute for participation in decision making; 'having one's say' is seen as an end in itself. Thus, quotation (b) above goes on to say "...more important, we must develop a way to know when sufficient facts and ideas have been discussed in public forum so that a decision can be reached".

3) A process having an instrumental value since 'responsible participation', as in (c) above leads to conservation and eliminates waste. In this sense, 'participation' is used in the context of small-scale local projects which cannot be expected to operate efficiently without the committed involvement of many people; for example, solar energy production "at something like community or city block scale" (CCS: 33), or neighbourhood recycling schemes, since "public awareness and participation are essential for effective waste reduction, management, and recovery" (CCS: 79).

The public desire for participation is therefore to be simultaneously encouraged, trivialized and deprived of its meaning; it is to be channeled into purely local concerns, or dissipated at the level of time-consuming but ultimately ineffective discussion.

Coalitions in Conditions of Scarcity

Buttel and Larson (1980: 333) argue that "the key axis of conflict over the long term will be between the capitalist and working classes", and suggest that the possible structural coalitions would be as in Table 3. They make two assumptions: firstly, that the two major pivots for coalitions of groups that shape different state structures are monopoly sector capital and monopoly sector labour; and secondly, that capital and labour will continue to have the greatest ties to the administrative and democratic spheres of government respectively.

When considering the prevalent environmental ideologies which Buttel and Larson associate with the three 'conserver societies' (Table 2), it becomes clear that the left conserver society is not one which the CCS consider seriously. As discussed earlier, their references to participation turn out to have little meaning at any level other than that of discussion and instrumentally-valued, strictly limited participation in local projects.

On balance, the CCS interpretation is most in line with the centre conserver society; the need for wise management, for the reduction of waste, the necessity of balancing competing demands are a recurring theme of CCS. Moreover, the major group coalition of monopoly sector labour with

TABLE 3. Group Coalitions, Environmental Ideologies, and Environmental Movement Organization in Three State Structures

State Structure	*Major Group Coalitions*		*Prevalent Environmental Ideologies*	*Predominant Branch of Environmentalism*
	*With Monopoly Sector Capital**	*With Monopoly Sector Labour***		
Centre	Monopoly sector labour	Monopoly sector labour	Reduction of waste, wise management, state must balance competing demands by environmentalists, capital and labour	Voluntary, organized
Right	Middle class	Competitive sector labour?	State must assume centralized, authoritarian control resource dedcisions should be made by a technically competent managerial elite	Institutional
Left	Competitive sector capital	Competitive sector labour and middle class	Necessity for decentralized, egalitarian society; state must encourage new forms of production that broaden participation in natural resource decision-making	Public

*Each coalition would include the administrative sector of the state.
**Each coalition would include the democratic sector of the state.

Source: Buttel and Larsen (1980: 337).

monopoly sector capital is suggested by their stress on the assumed mutuality of labour/management interests. However, there are also indications which seem to point to the 'right' scenario;

> environmental policy in the rightist state would tend to be administered by a stratum of government officials (ecological mandarins?) in the interest of their principal coalition partner, monopoly sector capital (Buttel and Larson, 1980: 340).

The knowledge elite which is regarded by CCS as being essential to the operation of a conserver society would probably operate most effectively in an institutional context. Evidence of the CCS tendencies to think in terms of 'ecological mandarins' is found in the emphasis they place on the 'future' which is, when necessary, to take priority over the present. The recurring assumptions of consensus concerning collective goals break down badly when the future is in question;

> Unfortunately the future has little economic or political power: it has no votes. The government in power, which is a surrogate for the country itself, must take the longer view. It is the responsibility of the government to ensure that future citizens are provided with options - if necessary a trade-off may have to be made against the demands and perceived needs of present citizens (CCS: 45).

The reminder that the future has no votes seems intended to preserve the appearance of the democratic process; decisions made against the interests of the existing electorate can be justified by claiming to speak on behalf of an electorate yet unborn. It is noteworthy that although CCS is strongly in favour of capitalism and the market economy, these references could be removed and references to the advantages of state-socialism or state capitalism substituted without changing the basic arguments of the report. References warning against too much government involvement are about equally balanced by references calling for more.

V. EQUITY AND THE CONSERVER SOCIETY

Introduction

It must be emphasized that no particular pattern of distribution follows necessarily and logically from the principle of "respect for the regenerative capacity of the biosphere"; Canada could conserve energy and resources and protect the environment while being far more - or alternatively far less - egalitarian than at present. And yet conserver proposals are inevitably distributional proposals, although they are not necessarily recognized as such;

> almost anything we do about the environment is likely to have considerable effect on the distribution of income and wealth (Boulding, 1970: 164).

Or, as Stretton puts it,

> People can't change the way they use resources without changing their relations with one another....Environmentalists want another economic revolution. What role are inequalities expected to play in it? (Stretton, 1976: 3).

The CCS authors reiterate that major changes in present patterns of resource use are essential. The issues of how resources are used in this "high consumption throwaway culture" (CCS: 14), of what is produced, by what means and with what degree of efficiency, and what modifications should be made in these respects, receive a considerable amount of attention throughout the report - a far greater amount of attention than does the distribution of these resources and products. The distributional implications of their proposals should therefore be examined. How are the costs of establishing the conserver society to be shared? Who gains and who loses? Is inequality in the conserver society to be much the same as in present-day Canada, or is this new society to be based on different principles of distributive justice?

There is an additional reason why distribution is relevant to any consideration of the conserver society. The conserver society is presented by the authors as being not only necessary but as intrinsically preferable to a consumer society; it is claimed to be qualitatively different, "a future that is not a mere extension of the present" (CCS: 6). This utopian element in the report makes the question of the degree of equality in the conserver society a legitimate one; since egalitarianism can be regarded as a value in itself, the emphasis placed on it affects the perceived desirability of any proposed future.

One other aspect of distribution needs to be considered. Schnaiberg suggests that

> The social acceptability of the planned scarcity model should be greatest where recent distributional history has been most progressive, and least where it has been most regressive (1975: 9).

This seems intuitively plausible, and to the extent that this view is correct, it requires that conserver society advocates should take into account not only present patterns of Canadian distribution but also recent trends.

Inequality in Canada

Income distribution in Canada is decidedly inequitable, with the lowest quintile of income recipients receiving about 4% of the total while the highest receives over 40%. There has been no trend toward a reduction of disparities over time; between 1951 and 1977 the share of the two highest quintiles increased slightly while that of the two lowest decreased (see Table 4). The distribution of assets is even more unequal, and the distinction between capital and income is a largely artificial one;

> For taxation and estate duty avoidance purposes, and for other social and legal reasons, income may be converted into capital, capital into income, and both into benefits that are neither money nor convertible into money (Titmuss, 1962: 23).

This is one reason why the apparent stability of income distribution over time probably underestimates important long-term trends toward growing inequalities in individual command of resources over time (Miller and Rein, 1972:119).

Taxation has little effect on the reduction of disparities. Income tax is only moderately progressive; what the National Council of Welfare (1976) describes as the "hidden welfare system" - more commonly known as tax incentives or loopholes[14] - operates to greatly decrease the progressiveness of income tax[15] by provisions for

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[14] The NCW also includes the differential use of universal social services.

[15] In 1977, the percentage changes to share of total income after tax as compared to before tax were +.6%, +.9%, +.5%, -.1%, -1.8% for the five quintiles respectively. Statistics Canada 13-210, *Income After Tax, Distribution by Size in Canada, 1977*.

TABLE 4.Percentage Distribution of Total Income of Families and Unattached Individuals by Quintiles for Selected Years.

Year	*Lowest*	*Second*	*Middle*	*Fourth*	*Highest*	*Total*
1951...........	4.4	11.2	18.3	23.3	42.8	100.0
1954...........	4.4	12.0	17.8	24.0	41.8	100.0
1957...........	4.2	11.9	18.0	24.5	41.4	100.0
1959...........	4.4	11.9	18.0	24.1	41.6	100.0
1961...........	4.2	11.9	18.3	24.5	41.1	100.0
1965...........	4.6	11.9	18.0	24.4	41.1	100.0
1967...........	4.2	11.4	17.8	24.6	42.0	100.0
1969...........	4.3	11.0	17.6	24.5	42.6	100.0
1971...........	3.6	10.6	17.6	24.9	43.3	100.0
1973...........	3.9	10.7	17.6	25.1	42.7	100.0
1975...........	4.0	10.6	17.6	25.1	42.6	100.0
1977...........	3.8	10.7	17.9	25.6	42.0	100.0

Source: Dominion Bureau of Statistics 13-529. *Income Distributions: Incomes of Non-farm Families and Individuals in Canada, Selected Years 1951-1965.* Table 12. Statistics Canada 13-207. *Income Distribution by Size in Canada, 1977.* Table 72.

deductions, exemptions, deferrals etc. Moreover, most other taxes are regressive:

> By far the most striking conclusion to be drawn from an examination of total tax payments is the extreme regressivity of the system at the lower end of the income scale and the lack of any significant progressivity over the remainder of the income range...Indeed, over the lower portion of the income scale, the system tends to contradict the ability-to-pay principle by taxing the poor at a higher rate than those who are better off (Maslove, 1972: 64 cited in L. Johnson, 1977: 26).

This contradiction of the ability-to-pay principle contributes to a situation in which large numbers of Canadians live in poverty. According to the three major national poverty lines, the numbers in 1976 were as follows:

Poverty Line	*No. in Poverty*
Statistics Canada	2,831,000[16]
Canadian Council on Social Development	4,423,000[17]
Senate Committee	5,372,000[18]

Source: Caskie (1979: 26).

What is striking is that even according to the most conservative poverty level, which is based on the absolute or subsistence approach, 12.7% of Canadians were living in poverty in 1976.[19]

As for the social security system, it has "never been diverted by an objective such as the vertical redistribution of income" (Martin, 1972: 150). There is a strong element of self-subsidization in its operation, which is largely concealed by the fact that income data are available for one year periods rather than total lifetimes. The old and the unemployed have previously contributed to the pensions and benefits which they subsequently receive. According to Djao (1979), its aim is rather to maintain and perpetuate existing socio-economic inequalities by mitigating their extreme manifestations.

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[16] Those spending more than 62% of their income on food, shelter and clothing (Caskie, 1979: 4).
[17] 50% or less of the average income (Caskie, 1979: 5).
[18] Approximately 56% of average income (Caskie, 1979: 5).
[19] Statistics Canada 13-207, *Income Distribution by Size in Canada, 1976*. Table 62.

The CCS Perception of Inequality

References to inequality or to income distribution are not frequent in CCS. What is emphasized throughout is the overall level of wealth in Canada; that Canada is "a prosperous nation" (CCS: 18) which has reached "a stage of considerable affluence" (CCS: 24), which has "a high material standard of living" (CCS: 10); a high-consumption society with an "ever-growing per capita demand for consumer goods" (CCS: 14). The repetition of such phrases tends to give the impression that all, or virtually all Canadians are participants in this general affluence, and statements which counteract this impression are very few.[20] At one point they state that

> Paradoxically, the most important problem is that of scarcity in the midst of abundance (CCS: 20).

and it seems that at last the authors are prepared to recognize the existence of poverty, and to confront the need for redistributive policies. But no - they are concerned with scarcities such as clean air and water, and there is no indication of any realization that these scarcities differentially affect those suffering from other scarcities. Also, as Enzerberger (1974) notes, scarcities of clean air and water have existed - largely unnoticed - since the start of the industrial revolution; then, they were confined to the residential and working districts of the poor, while now they attract attention by threatening to become all-pervasive. The existence of poverty, and of very large differentials in income and wealth are either ignored or glossed over throughout most of the report, and the few references to them are phrased so cautiously and so obliquely that they contrast strongly with the unequivocal statements on the general level of Canadian affluence.

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[20] Characteristically, the authors give the statistics on the increasing number of two-car households (CCS: 65), but not those on the number of households *without* a car - 21% in 1978 (Schrecker, 1980: 9).

Moreover, the authors' stress the *individual* as well as aggregate benefits of reduced consumption and of the "traditional values of thrift, saving, avoidance of waste, efficiency...(CCS: 30). Their argument that

> in a thoroughgoing conserver society one would envisage a different set of images of what would constitute the "good life" (CCS: 66)

as well as their advocacy of the principle of "joyous austerity" (CCS: 54) are used to legitimize the exclusion of distributional issues from the conserver society agenda - although logically they could have been used to urge both the necessity and the feasibility of redistribution.

The taken-for-granted nature of inequality is very clearly illustrated by a statement made during a discussion of the need for diversity in transportation systems. The authors say that concentrating on a single or monolithic system

> can mean that the needs of the elderly, the young the incapacitated, and the poor are overlooked. By including the notion of diversity in the initial planning one is only recognizing *the normal statistical distribution* of needs, roles, capacities, and *incomes* in a given population. (CCS: 31. Emphasis added)

Income is, of course, not normally distributed (i.e. not a bell-shaped curve); it is skewed. The phrase 'normal statistical distribution' is evidently intended as a metaphor, since taken literally it makes no sense, but its use serves to legitimize large disparities of income and makes them appear somehow 'natural' and inevitable. Furthermore, the inclusion of the needs of 'the poor' along with those of 'the elderly, the young, the incapacitated' reifies poverty by confusing categories in which there are necessarily wide and unalterable differences (e.g. age) and those such as income in which the differences are a function of political and economic arrangements which are subject to change. The existing inequality structure becomes something which should certainly be taken into account by planners, but which is otherwise so unremarkable that it requires no further comment. It is not regarded as something which requires either explanation or alteration; it has been removed from the area of problematic issues which are of relevance to a discussion of the conserver society.

This approach follows logically from the authors' equation of societal goals with the collective good, and their assumption of the availability of objective value-free knowledge. The former leads to the minimization of perceived inequalities, and discourages the disaggregation of the distributive effects of their proposals. The latter moves inequality into the realm of values, and therefore beyond the CCS area of expertise. Their dichotomization of fact and value leads them to draw a rigid distinction between 'technical' and 'political' matters.

Thus, for example, they warn us that

> some of the images that shape our aspirations may derive from minority lifestyles that intrinsically cannot be enjoyed by a majority. To the extent that "being rich" depends on being able to command relatively cheaply the personal services of others, everybody cannot be rich (CCS: 14).

and refer to the possibility that the limits to growth may be more social than physical or environmental. They then continue

> these kinds of questions are beyond the scope and competence of the Science Council to answer. We have tried to stick to practical matters, with an incremental approach, to identify some of the technological paths that lead in the right direction, toward sustainable relationships with material resources and the biosphere. Whether these paths, about which in our view we do not have much choice, imply other changes can only be decided by Canadians through democratic discussion. (CCS: 14)

It is noteworthy that on other occasions the Science Council has not so definitely excluded distributional issues from their 'scope and competence'. For example, the sixth annual report suggests that the production of an abundance of goods does not necessarily lead to the greatest national well-being *"particularly when our ability to provide for an equitable distribution of these goods is far from perfect"* (SCC, 1972: 59. Emphasis added). Two years later the annual report refers - in connection with the proposed conserver society study - to "the need to seriously rethink our economic future, and particularly *our ways of accumulating and distributing wealth*" (SCC, 1974: 28. Emphasis added). It is of course true that taking these earlier Science Council insights into account and following up their implications would have led to inconvenient conclusions with regard to the distributional effects of the CCS proposals. The political constraints imposed by the advisory role of the Science Council are perhaps relevant here, and contribute to the extent to which the consequences of the CCS proposals are not followed up. If they were, the authors would either be seen as advocating measures with an explicitly regressive distributional effect, or would be obliged to recommend the necessity of other distributional measures to counter the effects of their proposals.

The arbitrary nature of the fact/value, technical/political distinction shows up clearly in the CCS treatment of the one aspect of distributive justice which they regard as coming squarely within their area of expertise - their discussion of the future. Concern for the future is indeed the starting point of the whole report. It is the first part of the operational definition of a conserver society which was developed by the authors:

> The concept of a Conserver Society arises from a deep concern for the future, and the realization the decisions taken today...may have irreversible and possibly destructive impacts in the medium to long term (CCS: 13).

Other references to the future proliferate in CCS;

> To what extent are we ensuring that future Canadians will inherit complete natural ecologies in operating condition? (CCS: 19)
>
> A conserver society would act as responsible steward, to make sure to the best of available knowledge that present actions are not setting consequences in train that will impose serious costs on our descendants (CCS: 24)
>
> [A]ctions taken today have implications that will define the living conditions for future Canadians. What sort of Canada will we leave to them? If we perceive that present behaviour is likely to prove increasingly harmful to our descendants, what sort of modifications and structural changes must be initiated now to ensure a more desirable - and sustainable - future? (CCS: 27)

The CCS claims made so insistently on behalf of the future are not, however, self-evident; they may certainly be argued on grounds of distributive justice, but on those grounds there seems to be no justification for repeatedly urging the rights of future Canadians while dismissing the situation of poor Canadians here and now as an aspect of the "normal" statistical distribution of income. Nor is it clear why distributional impacts should have more consideration when they are inter-generational than when they are intra-generational:

> Poverty and premature death are as bad for poor people now as for their grandchildren later: except for its uncertainties, time does not alter most principles of distributive justice (Stretton, 1976: 7).

Inequality in the Conserver Society

The CCS authors state that their prescriptions are not aimed

> at slowing, or freezing in the *status quo*, the productive system in which large numbers of Canadians have done well, and in which large numbers of less well-off Canadians still hope to realize their aspirations. To the contrary, within finite resources and limited environmental regenerative capacity, it is only by being more efficient, more intelligent, more far-sighted, and by changing the style of some technologies, that we shall all find room for continuing[21] growth and distributive justice (CCS: 15).

Having said this, however, they then proceed to make various proposals and recommendations while virtually ignoring their distributional effects. By comparison, the Montreal GAMMA team, in their proposed policy options for three conserver society scenarios (differing in the extent of intended conservation), specifically take the distributional impact of each option into account (GAMMA, 1976).

The authors note that the application of conserver principles would result in the creation of new job opportunities in such areas as renewable energy, recycling, home insulation, waste recovery systems, etc., but that it would also result in decreasing demand for labour in many sectors of the economy. They add, too, that it is possible that "the full impact of automated technology may be yet to be felt. With the mini-computer the era of automation and automatic control systems has begun in earnest" (CCS: 25). The authors stress that as a result of these factors it is essential to reconsider the whole question of "what work it is that our society most needs to have done (CCS: 25), and criticize the inadequacy of the conventional economic wisdom which sees the answer in creating more investment to create more jobs, in spite of the fact that this only compounds resource and environmental problems. Industrialization has achieved its productive successes largely by ignoring resource limits, environmental impacts, and long-term energy availability, and yet:

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[21] Is 'continuing' intended to qualify 'distributive justice' as well as 'growth'? If so, it suggests the extent to which present distributional patterns are seen by the authors as being both satisfactory and unremarkable.

> as we are faced with employment dislocation, our only policy seems to be to try to drive the productive machine that much harder, putting still greater strain on resources and environment (CCS: 27).

The authors discuss the effects of employment dislocation, using the example of a requirement that automobiles should be made twice as durable as at present, thereby needing only half the present workforce in their manufacture. One possibility they mention "would be to distribute the employment through shorter work-weeks, longer vacations, sabbaticals, and re-training leave for workers" (CCS: 27). That is, they remind us that there is no intrinsic relationship between a given amount of work and the number of people employed to do it. Another possibility would be to place workers

> where society still has large unsatisfied needs, for example, in fields of information and knowledge, recreation, health care and preventive medicine, low-cost housing, and energy eficient technologies. The probable outcome would be that the need for material resources of all types would decline and energy demands would be lessened...(CCS: 27).

It is noteworthy that both these possibilities are simply mentioned in passing, in the context of a general discussion of work and employment; no suggestions are given as how they could be implemented, nor do they occur among the CCS recommendations.

A reconsideration of the meaning of work and employment is, as the CCS authors suggest, very necessary, but it is also futile unless it is joined to a reconsideration of the relationship between work, employment, and the societal reward structure - and these relationships are virtually ignored. One of the Science Council staff who worked on CCS observes that "[f]ull employment is a political objective and is a way of distributing income" (Cordell, 1980). But unless the income-distributing aspects of employment are given as much attention as is its usefulness and its impact on the environment, proposals for change are of little value. The authors state that

> There is nothing in economic theory that says that all people must be employed for wages, and certainly, as the domestic sector of our economy demonstrates, it is not necessary to be a participant in the wage-and-market sector to be a useful and productive member of society (CCS: 26).

Their choice of the domestic sector to illustrate the difference between useful work and employment is illuminating, since it ignores the complex relationship between the unpaid nature of this work, its lack of status, and its lack of recognition as productive labour.

The whole issue of socially useful activity could be approached much more flexibly and with fewer preconceptions if the issue of a basic social entitlement was considered first. Since the authors assert that "we already have the capacity to more than provide our basic goods and services with the present workers" (CCS: 26), the question of how to equitably distribute these goods and services should logically precede the discussion of what work needs to be done.

The proposal of a guaranteed annual income (though obviously no panacea), would have been a useful first step in this direction. As W. A. Johnson points out, the justification for the guaranteed annual income in the context of environmental problems is that it offers a positive incentive for reduced production. It could (1) expand the opportunities for public service, (2) support the development of new methods of livelihood appropriate to a time when it is no longer necessary or even useful for everyone to have an economically efficient job, and (3) discourage economic growth while still providing a flexible device for maintaining the stability of the economic system (W. A. Johnson, 1973: 181).

The authors make no reference to the possibility of a guaranteed annual income, although these outcomes are in line with their general remarks on the necessity of a flexible approach to work. Perhaps their reluctance to make any such specific proposal accounts for the manner in which they over-estimate the effect and extent of existing income-maintenance programs for the non-employed. They criticize the tendency of governments to deal with unemployment problems by make-work policies dating back to the depression years of the 1930s, and suggest that present income-transfer schemes make such an approach both unnecessary and unsuitable; "today the unemployed individual has a variety of ways to maintain income - unemployment insurance being the main source" (CCS: 25). Unemployment insurance, however, in view of its selective availability and temporary nature, must be regarded as a very insufficient means of maintaining the income of the unemployed:

> at the point where workers are thrown into the ranks of the unemployed, the trauma of that event is softened by the relatively high level of income they receive from unemployment insurance. If they remain unemployed for long, however, they are gradually phased into less costly forms of welfare. Finally, if their spirits are not yet eroded to the point where they docilely accept their fate as a reserve army of labour for the capitalist labour market, the various "opportunity" programs allow them to discharge their energy (and anger) in "safe" activities (L. Johnson, 1977: 30).

In the context of "opportunity programs", it should be noted that one of the report's recommendations is of a "conserver direct employment" program (CCS: 82), which would create jobs related to conserver problems and opportunities;

such projects would start with government assistance which could be phased out if and when such initiatives became commercially viable. The program would operate chiefly at community level, and would provide jobs for those who would otherwise be unemployed. But as the National Council of Welfare warns,

> We do not want to see community employment become a kind of "half-way house labor market" for those who have "failed" in the regular job market. This would be an indefensible regression, not only for the individuals involved, but for the professed social goals of the program itself (National Council of Welfare, 1973: 12).

One of the proposals to which CCS repeatedly returns is total cost pricing; the assumption is that total cost pricing is a way of sharing equally costs which are at present externalized or deferred into the future,

> the pricing mechanism should reflect, not just the private cost, but as much as possible the total cost to society, including energy and materials used, ecological impact and social considerations (CCS: 14).

But if 'social considerations' are to include a concern with the differential impact, then the stated objectives of such proposals are inherently contradictory, unless they are allied with proposals for the redistribution of income. Total cost pricing includes what is in effect a pollution tax, which is one "falling most heavily on those least able to afford it" (England and Bluestone, 1973: 194), It also includes rationing by price, which at first sight has an air of apparent justice to it and is obviously simpler to implement than most measures. But it is a measure of which the net effect is regressive (Stretton, 1976; Beakhust, 1979). Equal sharing of costs has a very unequal impact on those who are already living at or below the poverty line. Total cost pricing would apply to necessities as much as to luxuries; its effect would be greatest on those who spend most of their income on necessities. The single acknowledgement of the regressive effect of total cost pricing is the following statement;

> As fuel shortages develop and prices rise, social inequities will be aggravated. Gasoline rationing or a two-price quota system will likely be necessary soon to ensure fair distribution and encourage conservation (CCS: 74).

It is not clear why only gasoline is mentioned, since *all* energy price increases aggravate social inequities. As Sills notes, "any attempt to curtail energy use by increasing prices affects the poor enormously and the rich hardly at all" (1975: 31).[22] The 'social considerations' referred to by the authors demand that such a proposal be accompanied by a proposal for income redistribution, otherwise it would result in income differentials becoming significantly larger.

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[22] In 1978, households in the highest quintile spent 2.4% of their disposable income on shelter-related energy uses, while those in the lowest spent 8.1% - proportionately over 300% more (Miloff, 1980: 17).

Distribution and the Conserver Society

Most of the new problems of distribution brought about by the costs of resource scarcities and the costs of preventing pollution are superimposed on older distributional problems.

One of the effects of economic growth, particularly in the post World War II period, has been to maintain a widespread belief that considerable redistribution of income has actually taken place and that this trend is continuing. As Table 4 shows, there is no evidence to support this belief. Economic growth served rather as a substitute for redistribution, thereby achieving legitimation through majority support. For the rich, economic growth was advantageous since the demands of labour could be satisfied while their own share increased. For the poor, it offered a simple way of improving their standard of living while obscuring the fact that the increased benefits were not being distributed equally. Salgo (1973) regards economic growth as the major co-optative force operating on the labour movement, with a significant deradicalizing effect. What has frequently not been recognized is that the costs of economic growth - in terms of environmental deterioration and pollution - have not been distributed equally; a factor contributing to differential morbidity and mortality. Air pollution is a classic example of this differential distribution of costs (Handy, 1977). The effects of occupational disease are even more obvious.

Given the extent to which economic growth has served as a substitute for redistribution, and given that in the conserver society certain growth trends would be stopped and others reversed, it therefore follows that in such a society the traditional means of reducing distributional conflicts would be no longer available. For many, this prospect is in itself the strongest argument against any attempt to move toward a conserver society; they agree with Heilbroner that "the fight over the division of output must intensify if the size of the total output no longer grows as rapidly as before" (1978: 102). The CCS authors' inability to come to terms with the growth-restricting implications of their proposals follows from their refusal to recognize distribution as an intrinsic part of the conserver society *problematique*. This evasion of the issue leads to a contradiction - the assumption that the conflict-resolving distributional mechanisms whose operation is dependent on the existence of the consumer society will continue to operate after it is superceded by the conserver society. However difficult this problem may be, it cannot be solved by the CCS method of ignoring it.

Miller and Rein visualize the possibility that "both ecological and economic crises may force a reluctant society to redefine its ideas about equality...The politics of instability and crisis may push capitalist nations in more egalitarian directions in spite of themselves" (1972: 148). Stretton is more specific:

> The division of gains which the poor accepted on the way up will not be the division of losses which they will want to accept on the way down...if shortages of energy or other resources ever force a general fall in living standards. Passing (say) $2,000 annnual income per head on the way up, a society may be very unequal; passing the same figure on the way down it is likely to be more equal, or more bloodstained, or both...Even if growth merely slows or stops without actual losses, equality may suddenly seem more important (1976: 6).

VI. TECHNOLOGY, SCIENCE, AND SOCIETY

Introduction

This chapter discusses various meanings of technology; the relationship of science to technology; the role of technology; and the concept of conserver technology. Further, it examines the CCS approach to energy use and energy technologies. It concludes with a consideration of the CCS criteria for the evaluation of technology.

Definitions of Technology

There are very considerable difficulties in any attempt to define technology in a manner which is neither too restrictive nor too broad. Any analysis of technology should differentiate between artifacts, knowledge, and technique (the application of knowledge), but without obscuring the relationships among them. Even if the terminological problem is resolved, the difficulties of consistent usage appear to be overwhelming; it is probably true to say that all research on technology suffers from defects in respect of precision and consistency. As Price remarks, "the usual course is to pick a definition from thin air and then never use it (1972: 170).

Mitcham (1978: 232) points out that every definition of technology "highlights some real aspect of technology in the general sense, but under the guidance of a tacitly employed restricted focus". His own definition is "the human making and using of artifacts". This, of course, could include the whole built environment - in many cases the landscape itself. The greater the ubiquity of what is perceived as 'technology', the greater the difficulty of finding a vantage point from which it can be analyzed. This is exemplified in the work of Ellul (1964), whose concept of *technique* tends to be so broad and all-embracing that it encompasses virtually everything.

The CCS authors state:

> [i]n contrast to the essentially analytic approach of science, technology is basically a synthetic endeavour. It is the purposeful application of scientific knowledge to meet human needs (CCS: 5).[23]

The "tacitly employed restricted focus" of the CCS definition contains several elements. The CCS limitation of the knowledge to be applied to 'scientific' knowledge emphasizes both the supposed indispensibility of scientists to the development of technology, and their particular claim to understand the subject. The use of the word 'needs' gives a spuriously fixed and inevitable appearance to the ends to which technology is directed; it ignores the fact that the purposes of the makers and users of artifacts are necessarily different, and concentrates attention upon the latter. In the context of 'needs' it is worth noting that the authors later remark (with reference to transportation policies) that "mobility is a basic need, if not a basic right" (CCS: 31). This statement contrasts sharply with the previous misleading assumption of the unproblematic nature of human needs. At this point it becomes clear that the CCS reference to 'needs' takes place in the context of an unstated and taken-for-granted hierarchy - a hierarchy not so much of human needs as of human beings, and that it is the needs of some rather than all people which are to be met by the application of scientific knowledge.

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[23] The wording can be compared to Galbraith's

> The systematic application of scientific or other organized knowledge to practical tasks (1967: 24)

and

> The science of the application of knowledge to practical purposes (Webster's Third New International Dictionary).

Dickson defines technology as

> an abstract concept embracing both the tools and machines used by a society, and the relations between them implied by their use

and goes on to state that this definition "allows us to see technology, in common with the legal or the education system, as a social institution" (1974: 16-17).

The Relationship of Science to Technology

The relationship between science and technology as seen by the CCS authors is unidirectional; science leads to technology (although of course it is not suggested that all scientific knowledge has or is expected to have practical applications). But the attempt to differentiate in this way between knowing and doing only results in confusion;

> Modern technology involves scientists who 'do' technology and technologists who function as scientists....The old view that the basic sciences generate all the knowledge which technologists then apply will simply not help in understanding contemporary technology (Layton, 1977: 210).

Research indicates that only a minority of innovations result from new scientific knowledge; Price suggests that some 75% spring from market necessities (cited in Sabato, 1975: 41). The production and the application of knowledge therefore become inextricably entwined, placing in question the CCS differentiation between knowledge and application (which assumes the existence of a prior body of knowledge independent of the ends to which it is later applied).

Moreover, the CCS authors assume the existence of a homogenous scientific community, divided of course by disciplinary affiliation but by implication united by the Mertonian institutional imperatives of universalism, communism, disinterestedness and organized scepticism - "moral as well as technical prescriptions" (Merton, 1972: 68). However, the scientific community, far from being a homogenous entity, is differentiated in multiple ways. Johnston and Robbins (1977) analyze the extent to which fragmentation of scientific labour is determined by factors external to science, that is by the institutional environments in which the work takes place, and by the needs and demands of patrons, both state and industry. OECD data indicate that more than 50% of all R&D expenditure in member countries is made by and in the industrial sector (OECD, 1969). Sabato (1975: 40) quotes the R&D vice-chairman of General Electric; "let me say that every man who joins this organization knows why we are doing research: to make a profit".

Both the disciplinary and institutional affiliations of scientists have been shown to play an important role in determining the viewpoints of scientists in such controversies as, for example, the risks of radiation hazards from nuclear weapons test fallout (Kopp, 1979), and non-harmful environmental lead levels (Robbins and Johnston, 1976).

The Role of Technology

The CCS authors consider that

> a society both expresses itself and structures itself by the technology it uses" (CCS: 34)

The second part of this statement seems indisputable; given the long-term existence of artifacts, they must (regardless of existing techniques and knowledge) inevitably constrain human actions over time. But the meaning of the statement as a whole depends on the first part - in what sense is it *society* which expresses itself in the existing technology? Technological change is not

> some diffused property of society. Both individuals and, more importantly, organized production and other enterprises *make* technological change (Schnaiberg, 1980: 114).

The CCS formulation ignores the questions of how the particular form of expression and structuring in a given society has occurred historically, and how it is maintained. The authors do not deny the existence of undesirable social as well as environmental effects of technology, but concentrating on the effects and possible changes while attributing the design and organization to society as a whole results in a reified view of technology, which in spite of their denials appears to as quasi-autonomous.

Dickson argues that

> the technology possessed and developed by any society is the objective manifestation or crystallization of the power relations within that society (1974: 63).

That 'society' is not an adequate unit of analysis - and that technology does not develop autonomously - can be demonstrated in many specific cases. For example, during the process of industrialization, the replacement of the putting-out system by factories in textile manufacture was less an outcome of new developments in machinery than of the manufacturers' desire for greater control over a scattered, semi-independent workforce. In turn, the existence of the factories encouraged a self-perpetuating process of development of appropriate machinery - appropriate, that is, to both the employers demands for higher productivity and to the concentration of the workforce under one roof (Dickson, 1974; Marglin, 1974).

> It is important to emphasize that the discipline and supervision afforded by the factory had nothing to do with efficiency, at least as this term is used by economists. Disciplining the work force meant a larger output in return for a greater input of labor, not more output for the same input...The

> factory system, then, was not technologically superior to the putting-out system, at least not until technological change was channeled exclusively into this mould (Marglin, 1974: 94-5).

A more recent example is the development by university researchers in California of the mechanical tomato harvester and the new variety of tomato required for its operation. The consequences of these innovations included a decrease in the size of the labour force and a change in its composition, concentration of producers, and changes in tomato growing locations (Friedland and Barton, 1976). Winner describes this as

> an ongoing social process in which scientific knowledge, technological invention, and corporate profit reinforce each other in deeply entrenched patterns that bear the unmistakable stamp of political and economic power. Over many decades agricultural research development in American land-grant colleges and universities has tended to favor the interests of large agribusiness concerns...[T]he harvester is not merely the symbol of a social order that rewards some while punishing others; it is in a true sense an embodiment of that order (1980: 126-7).

The questions of what are the defects of contemporary technologies, and of what technologies would be appropriate to the conserver society, must be considered in the context of the determinants of technology, not just its consequences. As Dickson stresses, to suggest that technological change is in itself able to bring about a more desirable society is technological determinism carried to its furthest extremes:

> [t]he struggle for emancipation from an apparently oppressive and manipulative technology coincides with the struggle for emancipation from oppressive political forces which accompany it (Dickson, 1974: 13).

Conserver Technology

According to the CCS authors, conserver technology is that which is both environmentally and socially benign; it is consistent both with "respect for the regenerative capacity of the biosphere" and with their intention of building "a humane and democratic future" (CCS: 6).

The first requirement is expressed in the authors' statement that they are attempting

> to identify some of the technological paths that lead in the right direction, toward sustainable relationships with material resources and the biosphere (CCS: 14).

The second requirement - perhaps unsurprisingly - receives less sustained and critical attention. The authors speak of the need for "concern, not only for environmental effects but for other consequences of choosing one technological path over another" (CCS: 12), but at times they appear to be uncertain as to what these "other consequences" consist of, how they may be identified, or how much importance should be attached to them;

> we do not, at this point, know how many of our societal problems can be attributed to the way technologies are designed and organized (CCS: 11).

In effect, CCS readers are invited to supply their own interpretation of what qualifies as a societal problem associated with technology. This admission of uncertainty can be compared to the CCS claim referred to earlier that "we possess the technical and scientific knowledge to foresee the consequences of our acts with reasonable certainty" (CCS: 24). The juxtaposition of these two quotations suggests that in the second we should take "consequences" to mean "technical consequences" - which clearly illustrates the sporadic and intermittent nature of the attention which the authors pay to non-technical consequences.

The most specific reference to the non-technical aspects of technological consequences is the following;

> [w]hen a decentralizing social trend runs up against a technological trend that is inherently centralizing, or seen to be centralizing, feelings of alienation, loss of freedom, and abdication of responsibility may be the result. Responsible agencies should try to make sure that their systems are designed with sufficient diversity and responsiveness and that control is sufficiently dispersed that these desires and needs are taken into account and given room for expression (CCS: 34).

In general, however, the characteristics which the authors attribute to conserver technology are efficiency in terms of resource use, flexibility, diversity,and, in some cases, the capacity for decentralization and local control. They stress the need for careful attention to the question of when economies of scale are illusory, and would be found to disappear when total costs (environmental and social) are taken into account.

Soft and Hard Energy Paths

The CCS authors devote much of their attention to the question of energy supplies, since the form they take and their availability and cost are crucial to any consideration of possible societal futures.

It is generally accepted that we are nearing the end of the period of massive dependence on fossil fuels, and Lovins' classification of new energy strategies into 'soft' and 'hard' energy paths is relevant to any discussion of this issue (Lovins, 1977). Lovins considers the soft energy path to be one that relies on 'energy income' rather than 'energy capital'. The energy sources involved are renewable, diversified, unpolluting, mostly small-scale energy sources - solar, wind, water, biomass. There is a maximal emphasis on conservation,[24] on adaptation of energy supply to end-use - which involves not producing electricity for purposes for which it is not actually needed (such as space-heating) - and on technologies which are relatively simple and understandable, and potentially controllable by users rather than suppliers. The hard energy path involves the rapid expansion or development of capital-intensive centralized technologies. There is a strong emphasis on nuclear generated electricity, including breeder reactors, on large and complex projects for the exploitation of tar sands and oil shale, on so-called economies of scale. Such technologies tend to be hazardous in terms of health effects and environmental damage. Moreover, their scale and centralization makes them vulnerable to technical failure, human error or sabotage, all of which could produce major disruptions of supply, and necessarily involve extensive regulatory powers and the exclusion of the public in decision making.

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[24] This must be regarded as a major component of the soft energy path, the viability of which largely depends on reducing energy demand to realistic levels.

Lovins states:

> soft and hard energy paths are not *technically* incompatible - reactors and solar collectors could in principle coexist (1977: 59).

They are however logically incompatible in terms of their social and political meanings, their institutional and organizational requirements, and their competition for capital investment. Moreover, they demand a different approach. When compared, for example, with large fossil-fuel or nuclear generating plants, most renewable energy sources provide very small amounts of energy - each individually so trivial that it hardly seems worth considering. It is only when these small amounts are aggregated that they become of major importance.[25]

The CCS authors stress the need for conservation, and note that "the most immediate gains per dollar are likely to be made through conservation and improvements in energy efficiency" (CCS: 41). They discuss various soft energy technologies, and refer to the social and environmental costs of high-technology, centralized energy sources (CCS: 31-34). However, there is no indication that they regard soft and hard energy paths as fundamentally incompatible. This can basically be attributed to the fact that their discussion is in terms of individual *technologies* rather than Lovins' *paths*; that is, their arguments in favour of diversity obscure the issue of compatibility. It is noteworthy that although the authors were familiar with Lovins' work (CCS: 40),[26] they do not make use of (or indeed refer to) his concept of soft versus hard energy paths.

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[25] The same is of course true of the energy saved through conservation measures.

There is a considerable degree of ambiguity in the CCS assessment of the future role of nuclear energy; indeed, it is illuminating to find that the discussion of nuclear energy is included in the section on *renewable* energy. The authors state that present uranium fission nuclear reactors are generally regarded as a 'temporary' or 'bridging' energy source (CCS: 46). However, since they estimate that by the end of the century renewable sources will contribute at most 15-20% of the total energy supply (CCS: 46),[27] and since they take as a matter of course that the contribution of nuclear energy will not just be maintained but will continue increasing (CCS: 40), it is not clear what time-frame they have in mind for this 'bridging' energy source, nor, what is more important, to what it is expected to serve as a bridge. The authors note that "[t]he aim of a conserver society will be to achieve reliance on sources of energy which are in principle sustainable over the long term" (CCS: 46), but they also state;

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[26] Lovins was a contributor to *Conserver Society Notes*, which the Science Council published during the preparation of CCS to provide a "forum and focus" (CCS: 5) for discussion of the concept of a conserver society.

[27] "Present official estimates place the contribution of renewables at 3 per cent for 1990" (CCS: 40); their higher figure assumes more effective conservation measures.

> at this point in time, along with the U.S., the U.K., and Sweden,[28] we should leave open for choice the extent to which we will become dependent on the longer-term "breeder" reactors and/or thorium-cycling reactors, with the fuel handling and re-processing they will entail (CCS: 46).

There is therefore no firm commitment to a soft energy future, even at some indefinite date; The reader is left in doubt as to what importance should be attached to the CCS recognition of "the uncertainties regarding cost and the social and environmental acceptability of nuclear-electric systems" (CCS: 41), and of their estimate that renewable energy sources could be cost-competitive with nuclear without suffering the same objections (CCS: 32).[29]

The deficiencies of an approach which is unable to deal with vested interests and unequal power relations shows up clearly in the discussion of renewable energy. As Brooks and Paehlke (1980: 452) note, most of the largest economic organizations in Canada are committed to a hard energy path for reasons which include financial self-interest. But the CCS authors are concerned only with the fact that conventional energy technologies have "well established public and private institutional structures for research and development" (CCS: 76). They mention the drastic fluctuations in estimates of oil and gas reserves in recent years, but ignore the dependence of the National Energy Board on industry data, although as Olthuis points out;

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[28] Since then the results of the 1980 Swedish referendum have committed that country to phasing out its nuclear power program by the year 2010 (Jones, Johansson and Magnusson, 1980).

[29] A Canada-wide survey showed that 83% of respondents agreed or tended to agree that the federal government should spend as much on developing renewable energy sources as it spent on nuclear fission (Berkowitz, 1977: 137). In the fiscal year 1975/76, 1.4% of federal R&D expenditure on energy went to renewable energy; 76.9% went to nuclear (Wynne-Edwards, 1976: 17).

> Both industry and NEB gas reserve figures are high when the industry wants export licences and low when it wants permission to build pipelines (1980: 483).

They ignore the manner in which involvement in such an institutional structure as the Atomic Energy Control Board can produce 'scientific' evidence that nuclear energy is actually *safer* than solar (Inhaber, 1979).[30]

The ambiguities and contradictions in which the CCS authors involve themselves when discussing the desirability of various energy sources should be seen in the context of the strong commitment to nuclear power made by the Science Council throughout its existence. Another Science Council report regards the only barrier to the growth of nuclear energy as being "social acceptance of progress in developing satisfactory nuclear waste management and disposal systems"(SCC, 1979c: 46), while *The Weakest Link*[31] points approvingly to nuclear power as an example of "what the state can do when it perceives a need, provides a market, and facilitates the development of appropriate technology" (Britton and Gilmour, 1978: 169).

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[30] Both Inhaber's assumptions and methodology were subject to widespread criticism; see, for example, Holdren et al. (1979).

Wynne-Edwards (1976: 13) reminds us that Canada was involved in nuclear development from the outset, since it was the only source of uranium during the Second World War, and adds that nuclear power is "one of the few branches of high technology in which Canada is truly internationally competitive".[32] This past involvement and success constrains the perception of future possibilities; the Chairman remarks in the eleventh annual report;

> we should further the development of those technologies where we have historically shown excellence (e. g. nuclear energy, electrical transmission, communications) (SCC, 1977a: 27).

The contradictions apparent in the CCS discussion of energy serve as a reminder of the extent to which in the early development of science policy, "a single model of the impact of science on society was assumed. It was one based on the particular experience in military and, in the United States, space matters where science and technology had become a dominant innovative source" (Schmandt, 1975: 191). That is, the model for science policy advice was that of a complex, costly, high-technology project where public involvement was minimal or non-existent. This model has much relevance to the hard energy path, but none at all to the soft.

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[31] A Science Council background study - one of its major industrial strategy publications.

[32] But it should be remembered that in spite of the billions of dollars spent on nuclear R&D, at the time CCS was written nuclear energy accounted for only about 2% of Canadian energy consumption; less than wood (McCallum, 1977: 37).

The reiterated CCS concern for the future contrasts sharply with their willingness to regard nuclear power as a potential conserver society energy source. The links between the use of commercial nuclear reactors and the probability of military proliferation are well-established (Lovins, 1977), and it is the existence of nuclear weapons of an ever-increasing size, on an ever-increasing scale, which gives an additional problematic aspect to all contemporary discussions of the future - since the probability is so high that there is little future left to discuss. Moreover, the risk of accidents of various kinds (including catastrophic accidents) may be extremely small when calculated as probabilities per reactor year, but appear quite different when large numbers of reactors are operating for extended periods of time. Sorensen (1979: 17) stresses:

> societies using nuclear power today must accept major nuclear accidents not only as a theoretical possibility of no practical consequence, but as a risk to include in actual planning. It must be discussed how a society would survive a catastrophic accident, or...reject the nuclear power option.

In addition, most of the controversy surrounding the health risks of low-level radiation has been concerned with carcinogenicity, but in the long term, genetic damage (the effects of which accumulate over time) is probably more harmful. As Barnaby asks,

> Are we really justified in risking, to a quite unpredictable extent, future generations? (1980: 80)

Furthermore, there is the factor of thermal pollution (which the authors mention) - an inevitable concommitant of nuclear power generation - which must, in the long term, affect global weather patterns (CCS: 10).

The CCS authors attempt to examine the implications of energy use in a conserver society, but they cannot bring themselves to seriously consider the possibility of a non-nuclear future.

Criteria for the Evaluation of Technology

As said before, conserver technology must be both environmentally and socially benign. To the CCS authors, however, the potential of new technology to provide opportunities for development and expansion to Canadian industry is at least as important;

> ...a conserver approach will lead to the introduction of new technologies, new opportunities for Canadian business, and unprecedented challenges to the entrepreneurial spirit (CCS: 55).

> Benefits will flow to a wide variety of industries...(CCS: 57).

> Governments must seek to ensure the maximal degree of technological sovereignty in these new industrial areas...(CCS: 80).

These ambitions are not in themselves incompatible with the development of conserver technology, and it is undeniable that "the quest for more indigenous ownership becomes somewhat more possible and plausible in a scenario where very many new industries and technologies will be developed" (CCS: 56). However, in that case, proposed technologies must be measured by *both* conserver and technological-sovereignty potential standards. This is not done, and it is the conserver standards which are most often forgotten. The CCS criteria for the evaluation of technology are not applied consistently. The criteria of social appropriateness are applied only to those technologies which have already been judged acceptable by other (economic, political) criteria. The frequency with which the social benefits of decentralized alternative energy technologies are urged serves to disguise the reality that this is the *only* area in which this is consistently done.

This is particularly apparent in the case of microelectronics, which, according to CCS, encourage decentralization and are in general eminently suited to a conserver society - in spite of the authors' realization of the potential to create extensive unemployment (CCS:30, 61). The CCS discussion of microelectronics illustrates the authors' recurring inability to differentiate between physical decentralization of hardware, and decentralization of control. One of the participants in a Science Council workshop on the impact of microelectronics on work stresses that "the technology has the capacity to centralize information and change the focus of decision making", and cites two examples: the use of point-of-sale terminals not only to monitor inventory, but also to monitor the speed and errors of the cashier; and the potential for the head office of a bank to know precisely the state of a branch bank at any point of the day (deposits, withdrawals, the status of loans, etc.), thus downgrading the branch manager's decision-making authority (SCC, 1980: 11).

This confusion between the *location* of decentralized technology, and the *control* of that technology, is exemplified in two references to solar energy. In the first, the authors criticize the fact that

> Public utilities are already beginning to talk of "solar farms" with vast expanses of solar panels creating electrical energy to be fed into giant electrical grids (CCS: 40).

In the second, the authors suggest that

> the disparity between the capital-raising abilities of the supplier (the gas, oil, or electric utility) and the user (the homeowner) can be reduced, to mutual advantage, if the utility will install the needed energy-saving equipment and lease it to the homeowner...(CCS: 81).

In the area of transport, it is noteworthy that although the CCS authors state that the automobile is a major consumer of resources both in construction and use, and regard it as "the prototype for the mass consumption society" (CCS: 65), the possibility of the phased abolition of private cars is never considered. Instead, they suggest that auto manufacturers "are showing themselves increasingly aware of their responsibility for developing safer and more economical vehicles" (CCS: 66).

The CCS authors have no coherent and systematic criteria for assessing technology - not even individual technologies, far less the technology-as-a-whole which they say structures society. They take for granted the very features of technology which they claim to examine and critically evaluate.

VII. CONCLUSION

This thesis has been concerned with analyzing the concept of a conserver society, and the proposals and recommendations for change, presented by the Science Council in their report *Canada as a Conserver Society*. The sociology of knowledge has been used to relate the substance of the proposals to the social location of the council, in order to find out why CCS contains what it does, and what are the implications of this. As Cotgrove (1976: 32) points out, "...any model rests on assumptions, and abstracts from total reality only those variables that can be handled by the model".

The starting point for the Science Council's conserver society project was concern with the effects of human activities on the environment, both in terms of resource depletion and pollution. This appreciation of the need for a conserver society which would develop and utilize technologies making more efficient use of resources and having a less damaging effect on the environment served as a point of departure for other considerations: firstly, that such changing methods of resource use would not necessarily create shortages or hardships; and secondly, that present technologies have detrimental social as well as environmental effects. The study of the conserver society and the technologies appropriate to it moved therefore from necessity to acceptability to desirability, though rather than three stages these should be regarded as different aspects among which the focus of attention shifted. In principle, this offered the possibility of a utopian (transcending the present reality) approach, especially in respect to advocating technologies which are both environmentally and socially benign. There are frequent references in CCS which suggest that this is indeed what they perceived themselves to be doing.

However, the Science Council is also deeply involved in the development of an industrial strategy for Canada, which, given Canada's branch plant economy and dependence on the U.S.A., is based on the desire to reduce foreign ownership and develop indigenous manufacturing and R&D.

The Science Council commitment to industrial growth and development inevitably creates a multitude of contradictions in CCS, which is ostensibly concerned with the negative environmental and social consequences of industrial growth, rather than with fostering that growth. The authors' ideology expresses the interests of Canadian capitalism and of the scientific/technical elite; this creates further contradictions since they are unable to include in their analysis the structure of power and inequality within which the negative environmental and social effects have arisen. It becomes apparent that the objectives of the conserver society proposals are not only the transition to a sustainable and equitable society, but also the consolidation of capitalist enterprise and the advancement of the interests of the scientific/technical elite, and that the latter objectives tend to take priority over the former. The analysis of the transition to a sustainable and equitable society is therefore overlaid with other considerations which necessarily obscure and distort the ostensibly primary objectives of CCS. As a consequence of this, the analysis is inadequate even in terms of resource/ environment considerations; the proposals are largely limited to token conservation attempts. This is particularly apparent in the authors' discussion of the principle of total cost pricing, and the weakness of their proposals for its implementation.

The stress on the importance of participation obscures the fact that its value is, to the authors, almost purely instrumental - participation in the running of small-scale local projects which could not be expected to function efficiently otherwise. It is seen as having the further advantages of defusing potential conflict, and, when occurring at the level of discussion, of serving as a substitute for participation in decision making.

The reiterated concern for the rights of future Canadians disguises the fact that most of the proposals are regressive with respect to equity. The degree of inequality, and the extent of outright poverty in Canada are never admitted; the emphasis is on *overall* prosperity and high consumption. The regressive distributional effects of their proposals are kept from becoming explicit by the fact that the authors refrain from disaggregating them.

Given the subject matter of the report, and given the authors' emphasis on the search for "technological paths leading in the right direction" (CCS: 14), the key question which should have been kept in mind throughout is that posed in one of the Science Council's annual reports:

> What technology do we need to invent our own future? (SCC, 1975: 18).

In CCS this question is not even given sustained attention, much less answered.

It is clear that for the question to be meaningful, the prior question of what future we wish to bring about must be answered. Given the CCS uncertainty on this point, it is hardly surprising that the authors are unable to give the subject the critical analysis it requires. Individual technologies are discussed, but technology as such - particularly its determinants - is not examined in its totality, in spite of the claim that a society both expresses and structures itself by the technology it uses (CCS: 34). The CCS discussion of technology, and the technologies appropriate to a conserver society, suffers from the lack of any consistent standards of evaluation. The emphasis on the benign social and environmental effects of *some* technologies (notably those related to renewable energy) conceals the fact that these criteria are applied extremely selectively.

The conserver society proposal, although put forward as utopian, is ultimately ideological (in Mannheim's use of the terms); it proposes changes which would support and strengthen the position of the dominant class, while claiming to represent the interests of all Canadians. In CCS, the rhetoric of change and transformation serves to obscure the deeply conservative character of the main tendencies.

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